

**Exploring Promising Practices for New Technologies in
Arts Education through Action Research**

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Abstract

This study explored collaborative inquiry as a professional learning model for five elementary teachers at an inner-city school in Western Canada. Collaborative inquiry – a branch of action research – was the process used to support teachers’ professional learning in the use of technology in their arts education programs. The research questions were: (a) in what ways has the collaborative inquiry approach to professional learning had an impact on teachers’ learning and thinking about the use of ICT in arts education? (b) in what ways has the collaborative inquiry approach to professional learning had an impact on participants’ changed practice? and (c) how do collaboration and dialogue foster the construction of knowledge related to teachers’ integration of ICT to support their arts education program?

The findings suggest that collaborative inquiry was an effective strategy for professional learning and impacted teachers’ learning and thinking about the use of technology in their arts education program in several ways. There were indications that the collaborative inquiry group afforded social-emotional support, a forum for dialogue and collaboration, as well as an avenue to explore alternative perspectives and new ideas. It was also evident that new habits of mind were beginning to emerge. Teachers felt increased confidence and efficacy which led to risk-taking and exploration of new technologies, an increased capacity for evaluating ICT with pedagogical intent, as well as a strengthened ability to think reflectively about their practice. Furthermore, changes in practice were evident in the following areas: subject matter and materials, organizational structures, roles and behaviors, knowledge and understanding, and value internalization. And finally, the findings reveal that dialogue and collaboration are important factors in helping teachers foster their construction of ICT knowledge. These processes helped advance understanding as participants challenged one

another, pushing each other to a higher level of pedagogical and divergent thinking. Dialogue sessions offered participants a powerful forum for idea generation, idea sharing, and cooperative problem solving.

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Table of Contents

Abstract	ii
Acknowledgements.....	iv
Table of Contents.....	v
List of Tables	x
List of Figures.....	xi
CHAPTER ONE: Background to the Study	
Introduction.....	1
Context of the Study	3
Research Problem	5
Purpose of the Study.....	8
Significance of the Problem.....	8
Research Question	11
Research Objectives.....	11
Definition of Terms.....	12
CHAPTER TWO: Review of the Literature	
Chapter Overview	14
Arts Education	14
Arts Integration	17
Technology as an Enabling Tool in Arts Education	20
Effective Professional Development.....	28
Teacher Learning	30
A Way Forward through Action Research.....	32

Challenges of Action Research	33
Types of Action Research	34
Collaborative Inquiry as a Form of Action Research	35
Challenges of the Collaborative Inquiry Approach	38
Theoretical Framework	
Constructivism	39
Social Constructivism	41
Change Theory	42
CHAPTER THREE: Methodology	
Chapter Overview	47
Research Design	47
Innovation	50
Participants	51
Timeline	51
Data Collection and Procedures	51
Data Analysis	56
Ethical Considerations	59
Research Quality	60
Limitations of the Methodology	61
Conclusion	63
CHAPTER FOUR: Results and Discussion	
Chapter Overview	65

Impacting Features of a Collaborative Inquiry Model on

Professional Learning and Thinking.....	65
Time and Support for Exploration.....	65
Immediate Application to Practice.....	67
Peer Coaching and Mentoring.....	68
Increased Confidence and Efficacy.....	69
Access to Technology Resources.....	71
Individualized Professional Development.....	71
Features of the Collaborative Inquiry Model.....	74
Constructivist Learning Environment.....	75
Collaborative Dialogue and the Importance of Social Learning.....	75
Sustaining Learning over a Longer Term.....	76
Learning to Evaluate Technology with Pedagogical Intent.....	78
Fostering Reflective Practice.....	79
Impact of a Collaborative Inquiry Model on Changed Practice.....	81
Changes in Subject Matter and Materials.....	82
Changes in Organizational Structure.....	85
Changes in Roles and Behaviours.....	87
Knowledge and Understanding.....	88
Value Internalization.....	90
Other Facets of Changed Practice.....	92
Changes in Collegial Relationships:	
Professional Learning Communities Foster Teacher Learning.....	92

Amplifying Teacher Voice:	
Teachers Taking Ownership of their Professional Development	93
Fostering the Construction of ICT Knowledge through Collaboration and Dialogue.....	94
Social Construction of Knowledge	94
Importance of Scaffolding	95
A Professional Learning Community is Born.....	97
Zone of Proximal Development.....	98
Social Emotional Climate	99
Power and Potency of Collaborative Learning	101
Knowledge Construction: Importance of Dialogue and Collaboration	103
Key Indicators of Changed Practice	104
Plans for Changing Practice.....	104
Advancing Understanding	105
Reducing Isolationism	105
Fostering Divergent Thinking.....	106
Fostering Divergent Thinking through	
Online Professional Learning Communities	107
Social Constructivist Perspective.....	107
Shortcomings	108
Diverse Range of Technology Proficiencies.....	108
Time	109
Personal Reflections.....	110
Conclusion	111

CHAPTER FIVE: Conclusions and Recommendations

Chapter Overview	114
Restatement of Purpose.....	114
Summary of Key Findings	115
Implications for Professional Development.....	116
Implications for Classroom Practice.....	118
Future Directions for Research	120
A Final Word	121
References	123
Appendix A.....	142
Appendix B	146
Appendix C	153
Appendix D.....	163
Appendix E	165
Appendix F.....	167
Appendix G.....	170
Appendix H.....	172
Appendix I	174
Appendix J	178

List of Tables

Table 1. Data Matrix	52
Table 2. Emergent Themes by Data Source.....	64

List of Figures

Figure 1. Nested research design approach	48
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Chapter One: Background to the Study

Introduction

The recent explosion of Information and Communication Technologies (ICT) and corresponding Web 2.0 movement presents consequent shifts in the way we live, work and learn. This current upsurge has enormous implications for teaching and learning, confirming that computers have become an essential and undeniable element in contemporary education (Radcliffe-Thomas, 2008).

As new digital tools emerge and permeate our schools and classrooms, possibilities for reshaping and transforming pedagogy are without limit. New technologies offer unprecedented potential for innovative teaching and learning strategies across all areas of the curriculum, but particularly promising for what has been customarily viewed as the creative corner of the curriculum – the arts (Creating Spaces, 2003; Texas Commission on the Arts, 2001). While beginning arts teachers generally face new technologies with open minds and a sense of adventure (Davies & Worrall, 2003, Dunmill & Arslanagic, 2006; Wood, 2004), the creative potential of ICT has not yet been fully realized in many arts education programmes (Creating Spaces, 2003; Dunmill & Arslanagic, 2006). While the potential exists for ICT to reshape and transform pedagogy, many arts educators have not yet recognized its possibilities to enhance teaching and learning in the arts, and consequently, have not fully embraced ICT as part of their practice (Creating Spaces, 2003; Davies & Worrall, 2003; Radcliffe-Thomas, 2008).

Though the literature devoted to technology in education is replete with claims concerning its contribution to teaching and learning in schools as a whole; studies about the impact of ICT on learning in arts education are only now beginning to emerge (Dunmill &

Arslanagic, 2006; Texas Commission on the Arts, 2001). What little research has been conducted paints a disappointing picture for arts educators, leaving much of the creative potential of ICT untapped and unrealized (Radclyffe-Thomas, 2008). “The situation for ICT in art and design is getting worse, not better” (Arts Council of England, 2003, p. 7). Statistics show a pattern of poor and declining use with little evidence that teachers are engaged with the creative process in their use of ICT (Arts Council of England, 2003).

How is it then, that those teachers responsible for fostering students’ capacity to imagine, explore, experiment and create are not capitalizing on some of the most engaging and innovative tools to inspire our students? Recent research points to a number of barriers teachers face in adopting technology into their practice: (a) teachers’ lack of confidence in using ICT (Demetriadis et al., 2003; Jones, 2004; Hughes & Ooms, 2004, Scrimshaw, 2004); (b) access to appropriate hardware and software (Mumtaz, 2000); (c) lack of time to experiment with and integrate technology into learning experiences (Fabry & Higgs, 1997; Mumtaz, 2000); (d) and more generally, teachers’ resistance to change (Cuban, 2001; Hennessy, Ruthven & Brindley, 2005; Snoeyink & Ertmer, 2001). But perhaps the single most identified barrier to the uptake of ICT by teachers is the lack of appropriate professional learning opportunities (Dawes, 2001; Hughes & Ooms, 2004; McKenzie, 2001; Milton, n.d.). Research suggests that teachers feel ill-prepared to integrate technology to support student learning in an innovative manner (Cradler, Freeman, Cradler & McNabb, 2002; Hughes & Ooms, 2004), and consistently report an increased need for professional development to effectively employ ICT in their practice (National Center for Education Statistics, 2000).

As the ICT mentor for my colleagues, I have genuine interest in helping teachers embrace new technologies in meaningful and applicable ways that engage their students. As an arts-

infused school, the arts are central to much of our programming, and many of the teachers I work with adopt an integrated pedagogical stance, teaching core curriculum *through* the arts. I am interested in developing and implementing a professional learning model that gives teachers new tools for using technology creatively in their arts education practice, as well as a forum to learn from and collaborate with one another.

Context of the Study

Our school is committed to providing an arts education for *all* children, and as such, one of our most significant school priorities is implementing MECY's (2007) new *Arts Education: Draft Manitoba Curriculum Frameworks* (Sunny Oaks Community School Plan, 2007¹). As indicated by the excerpt below, we are dedicated to providing quality arts-rich programming to help *all* learners succeed, and believe the arts to be powerful tools for learning across the curriculum.

Our programming supports the placement of the *Arts* at the center of the curriculum and advocates creative use of *technology* to enhance the elementary school experience. At Sunny Oaks School we realize the importance of the arts to a balanced education. Research shows that participation in the arts has a positive effect on academic and social development for children of all ages. Sunny Oaks School's arts enriched learning environment nurtures academic excellence by developing the imagination and important life skills of critical thinking, discipline, effective communication, creative problem solving, risk-taking and confidence. Learning through visual art, music, dance and technology motivates children to learn, stay in school and seek advanced education. Arts and Technology programming broadens the focus from linguistic skills to other

¹ This document will not appear in the reference list in order to protect the school's identity.

intelligences and ensures that all children have the opportunity to participate. (Sunny Oaks School Community Brochure, 2007, pp. 3-4)

The teachers at Sunny Oaks School been involved in a variety of professional development programs to support the integration of the arts into core curriculum such as Learning Through the Arts, ArtsSmarts, Inner City Art Training, and Arts Alive, and continue to build upon their repertoire of arts-based teaching strategies to foster student success. In addition, two teachers from the school have been involved in arts curriculum development and implementation initiatives for the province of Manitoba. The committed educators at Sunny Oaks School are champions for arts education in the school division, and are considered divisional leaders in arts-infused programming. They share a common philosophy that an arts education program engages students of all languages, cultures and abilities; sparks imaginations; energizes and enlivens the classroom and school climate; builds confidence; and inspires students to stay in school (Deasy, 2002; Fiske, 1999; Greene, 1995; Upitis & Smithrim, 2002).

As the technology mentor for my colleagues in an inner city school in the province of Manitoba, my role is to support teachers' infusion of technology into all aspects of the curriculum. Other schools in the our school division also employ technology mentors to facilitate technology programming, but distinct responsibilities of the mentor vary from school to school. My role – as with other specialists in our school – is collaborative in nature, working *with* and *alongside* classroom teachers to implement technology into the learning context. The “Lead and Support” co-teaching model (Friend, Riesing, & Cook, 1993) is most often employed in my role as technology mentor, and I shift flexibly between assuming the “lead” position, and “support” position, depending on the teacher’s comfort level with

technology, the lesson or project, and the context. Planning is a large component of the co-teaching model, and is the responsibility of both members of the team. As the technology mentor, I try to keep abreast of the learning taking place in each classroom, and through weekly in-class support periods, I am able to familiarize myself with the current class interests, investigations and projects. These support periods provide opportunities for the teacher and mentor to share ideas and discuss possibilities around how ICT might support students' learning. As a technology mentor, my responsibilities at the school level include: (a) planning technology-rich experiences or projects with teachers, (b) modelling lessons, (c) offering one-on-one or small group professional development, and (d) fostering collaboration among teachers and students (Foltos, n.d.)

Since 2006, our school has been implementing *Literacy with ICT across the Curriculum* (LwICT) (Manitoba Education, Citizenship and Youth, 2006) – the provincially mandated continuum that is designed to help students use ICT responsibly, in order to foster critical and creative thinking about textual, numerical, visual and aural information. Since the Action Research Phase of *LwICT Across the Curriculum*, Sunny Oaks School has been implementing and reporting on students' progress in the use of technology to support learning. Technology is viewed as an enabling tool to support students' arts-based learning as well as creativity across the curriculum. Technology infusion is also considered to be a motivating instructional strategy for students, presenting teachers with new and interesting tools for teaching arts-related content.

Research Problem

Over the last few months, my role as technology mentor has changed, and the time I have to collaborate with teachers has been minimized. While I continue to meet with classes

regularly in the technology lab, planning and collaborating time with teachers is extremely limited. This limited collaborative time presents many challenges for me and the teachers I work with whom I work. First, my ability to plan and model authentic lessons for students and teachers suffers. I feel disconnected from classroom learning, and unable to model technology infusion in a creative way that connects meaningfully to students' own arts learning. Second, I find that as busy teachers, we do not have the time to research, explore and "play" with new digital tools to develop facility with them, and as a result, we often go back to the "tried and true recipes" rather than taking creative risks to explore the potential of new technologies (Jones, 2004; Fabry & Higgs, 1997; Schifter, 2008).

Resnick (2007) reminds us of the importance of engaging teachers in creative pedagogical thinking and sharing.

To succeed in today's Creative Society, students must learn to think creatively, plan systematically, analyze critically, work collaboratively, communicate clearly, design iteratively, and learn continuously. Unfortunately, most uses of technologies in schools today do not support these 21st-century learning skills. In many cases, new technologies are simply reinforcing old ways of teaching and learning...Just as students need to engage in the creative thinking spiral to prepare for the Creative Society, educators and designers must do the same. We must imagine and create new educational strategies and technologies, share them with one another, and iteratively refine and extend them. (p. 22)

Despite the tremendous innovative possibilities of new technologies, the creative potential for teachers of ICT to truly support and enrich learning in the arts has not yet been realized (Davies & Worrall, 2003). This point is echoed by the U.K's Office for Standards in

Education (2002): “Progress in the use of ICT in art and design is uneven, with the occasional pocket of exemplary practice, which is sometimes little known outside the school or the department” (p. 4).

New technologies have potential to transform teaching and learning - not only in the arts but across the curriculum. Unfortunately, new technologies are used to simply cement existing practices, refashioning and repackaging old methods and processes, doing little to challenge the status quo (Hughes & Ooms, 2004; Mumtaz, 2000; Sutch, Rudd & Facer, 2008). Goodson & Mangan (as cited by Hennessy et al., 2005) found evidence of “reshuffling the pack of cards, but little evidence of anybody trying a new game” (p. 119). According to Cuban (2001), “less than five percent of teachers integrated computer technology into their curriculum and instructional routines” (p. 133). In fact, “the overwhelming majority of teachers employed the technology to sustain existing patterns of teaching rather than to innovate” (p. 134). Much research has found that, while there are exceptions, teachers’ use of ICT is often limited to: (a) passive participation on interactive websites, (b) drill and practice, (c) reward time activities, (d) publishing or presentation platform, (e) electronic worksheets, and (f) information retrieval or research tool (Cuban, 2001; Hughes & Ooms, 2004; Schifter, 2008; Scott, Cole & Engel, 1992; Williams, Coles, Wilson, Richardson, & Tuson, 2000).

Despite significant increases in technology infrastructure spending for K-12 schools, access to technology has not significantly altered teaching and learning strategies to promote critical and creative thinking (Buckingham, 2007; Creating Spaces, 2003; Cuban, 2001; Hughes & Ooms, 2004). Many teachers, even today, still view technology as a *set of skills* to be mastered, rather than approaching ICT as a creative tool for learning, infused within the learning context (Buckingham, 2007). Arts education in today’s Knowledge Age must

embrace new technologies and pedagogies that suit active, exploratory, inquiry-based learning to promote creative and critical thinking (Dunmill & Arslanagic, 2006).

While teachers are generally open to the idea of using new technologies in their practice, the kinds of educational technology training programs offered to educators are not inspiring transformative practices. Current professional development for teachers in the area of technology in our school division is often staged as single day, “one-shot-deal” workshops, and do not take into account the distinct needs, questions or dilemmas of individual teachers or schools (Foltos, n.d.; Garet, Porter, Desimone, Birman & Yoon, 2001; McKenzie, 2001). Workshops are typically presented with a focus on the software or new technology such as “SMART Board Basics,” but teachers’ own classroom contexts are not often considered, nor are their learning styles, personal preferences or proficiency levels with ICT (McKenzie, 2001). For example, a kindergarten teacher with little ICT experience, working in an arts-based, inner city school might be grouped with an ICT proficient grade three teacher working in a suburban neighbourhood, whose school values traditional academic achievement in literacy and numeracy.

Purpose of the Study

I am looking for a new way forward in my role as technology mentor, to provide quality professional development for teachers, responsive to their unique needs, in order to help them integrate technology in a meaningful, creative, purposeful way, ultimately enhancing student learning in, through and about the arts.

Significance of the Problem

The rapid infusion of new technologies into all walks of life present corresponding shifts in the way that we approach teaching and learning in all areas of curriculum, and the arts are no

exception. Such pedagogical transformations in the arts occur in the use of new digital tools for creative expression, in building virtual learning communities of arts educators at a distance, and in the use of interactive information technologies to enhance teaching and learning. New digital tools present tremendous potential, as well as challenges, for educators worldwide (Texas Commission on the Arts, 2001).

Manitoba, Education, Citizenship and Youth (MECY, 2007) recently launched the *Arts Education: Draft Manitoba Curriculum Frameworks* presenting curricular K-8 outcomes in four art forms: dance, drama, visual art, and music. The recommended minimum instructional time for arts education is 180 minutes per 6-day cycle or 10% of the instructional day for Kindergarten to Grade 4 and 144 minutes per 6-day cycle or 8% of the instructional day for Grades 5-8. The choice of which combination among the four arts curriculum documents to implement rests as a school-based decision. In addition to the new *Arts Education: Draft Manitoba Curriculum Frameworks*, MECY (2006) also mandated policy that all schools are required to implement and report on *Literacy with ICT across the Curriculum* for students in grades K-8 beginning in 2006-2007 with full implementation for 2008-2009. Indeed, in Manitoba, curriculum is being transformed significantly to meet the changing needs of 21st century learners, so that they may develop multiple literacies that will allow them to respond to changing ideas, attitudes, and technologies as their communities and their world evolve.

If we want our students to be engaged in the learning process, we need to capitalize on opportunities to use technology in innovative and authentic ways. Teachers face significant challenges in addressing the many mandated curricula – especially at the elementary level, where most teachers are generalists who are required to teach several subject areas. If arts programs are to be implemented by schools and recognized by teachers as valuable, ICT must

be embraced as an integral part of the purpose and practice of arts education. Arts educators need to acknowledge the creative potential of ICT and devise thoughtful ways to harness new technologies to support and enhance the creative work that is happening in arts education programs. “Arts education in today’s world...needs to embrace new technologies and pedagogies that suit active, exploratory, inquiry-based learning to stimulate creativity and creative thinking – key features of arts practices – in rich, connective contexts” (Dunmill & Arslanagic, 2006, p. 38).

Simultaneously, teachers need time to develop their repertoire of arts teaching strategies to include ICT and to implement any significant changes in their practice (Bitner & Bitner, 2002; Corcoran, 1995; Rodriguez, 2000). There is a growing challenge in the field to design, establish and implement strategies to develop teachers’ knowledge and skills in order to effectively use technology as an instructional tool. Surveys show that teachers are interested in technology, but need meaningful opportunities to develop their capacities (Cradler, Freeman, Cradler & McNabb, 2002). According to the U.S. National Center for Education Statistics (2000), time and time again, teachers report an increased need for professional development to facilitate use of technology to improve student learning. On the more local level, Morin (In press) found that there is a “lack of technology-based arts pedagogy” evident in some Manitoba schools and a high need for professional development.

As new technologies emerge, the majority of arts educators approach their practice with optimism, open minds, and a sense of adventure (Davies & Worrall, 2003; Wood, 2004). Our curiosity and willingness to experiment and “muck about” with digital tools can yield interesting results, both in the context of our teaching, and in our students’ creative work. While open-mindedness and risk-taking are desirable, if not necessary attitudes when working

with new media, we need systematic research to inform our practice. Little research has explored the creative and communicative potential of what teachers and their students can do *with* this new repertoire of tools (Creating Spaces, 2003). New models for professional development need to be adopted and evaluated in order to generate new knowledge for this rapidly expanding field within education.

Central Research Question

The central research question to be explored is: As an ICT mentor, how can I use the principles of action research to support teachers' professional learning in the use of technology in an arts education program? The following sub-questions helped to guide the study further:

1. In what ways has the collaborative inquiry approach to professional learning had an impact on teachers' learning and thinking about the use of ICT in arts education?
2. In what ways has the collaborative inquiry approach to professional learning had an impact on participants' changed practice?
3. How do collaboration and dialogue foster the construction of knowledge related to teachers' integration of ICT to support their arts education program?

Research Objectives

The purpose of this study was to explore ways to help teachers to creatively and effectively use technology to enhance teaching and learning in an arts education context. The project offered teachers the time and opportunity to try new ideas, reflect upon their experiences and learn from others. As a result, participants honed their teaching with technology to enhance educational experiences for their students. In essence, I sought out to explore and promote promising practices and models for technology in arts education.

Definition of Terms

Several terms are used in this report that may require definition. The following is a list of terms operationally defined in the context of this particular study:

Blog: Short for weblog, a website that contains an online personal journal with reflections, comments, and often hyperlinks provided by the writer.

Creativity: The ability to produce something new and of value, through imaginative skill, whether a novel solution to a problem, a new technique or device, or a new artistic object or form.

Digital tools: Electronic media that work on digital codes (e.g., interactive whiteboards, cell phones, digital video, and internet).

ICT: Information and Communications Technology, the umbrella term that includes all technologies for the manipulation and communication of information.

New media: Artworks that use computers or communications technologies in digital creative expression.

New technologies: Collective noun for all cutting-edge, emergent digital technologies, resources and media.

Web 2.0: Popular term used to describe the second generation of web development and design that aims to facilitate communication, information sharing, interoperability and collaboration on the World Wide Web. The term Web 2.0 signifies the transition from collection of static websites containing information (Web 1.0) to a more dynamic, interactive, social, and content-sharing environment. Examples of Web 2.0 tools include: *Skype*, Voice Over the Internet Protocol software enabling users to connect for free from computer to computer all over the world using voice or video; *Wikis*, a web page that enables users to share and edit information;

Podcasts, digital audio or video recordings that can be created, accessed, shared and consumed using a variety of mediums (mp3 players, cell phones, computers); *YouTube*, a forum to share video clips with a global audience; *Ning*, an online service to create, customize and share a social network; *Slideshare*, a site enabling users to host a presentation and share it with others; *VoiceThread*, a collaborative, multimedia slideshow that holds images, documents, and videos, allowing users to leave comments in five ways – using voice, text, audio or video; and *Flickr*, an image and video hosting website, allowing users to share personal photographs in an online community platform.

This chapter has outlined the context for this study, the research problem and its significance, as well as the purpose of the study, and the research questions. It also defined terminology that is particular to this study. The next chapter presents a review of related literature, and offers a discussion of the theoretical framework for this study.

Chapter Two: Review of the Literature

Chapter Overview

This chapter presents the related literature that is used to build a conceptual and theoretical foundation for a study of new technologies in arts education. The chapter unfolds thematically beginning with a broad discussion of arts education and arts integration, narrowing to a discussion on technology as an enabling tool in arts education. The chapter proceeds with a discussion of effective professional development models, and concludes with a discussion of action research and collaborative inquiry as viable models for teacher learning.

Arts Education

Throughout the history of civilization, the arts have played an important role in defining, shaping and communicating who we are, where we come from, and what we believe. The arts tell our stories. When we engage in the artistic experience – whether by creating art, or immersing ourselves in the creative endeavours of others, our lives are enriched personally, culturally and socially. The arts engage the human spirit in deeply powerful ways. Among the highest expression of all cultures, the arts transcend boundaries of time and place, connecting us through the universal languages of literature, visual art, drama, music and dance. The arts are an integral aspect of human knowing.

Today it is recognized that to be a truly educated person, one must not only come to know and appreciate the arts, but also have many opportunities to participate in creative work. This means solving problems in diverse and imaginative ways, and looking for solutions through an interdisciplinary lens. Multiple intelligence theory has expanded our view of how we learn, and come to see our potential. The arts play a vital role in our learning, because they employ a range of intelligences and learning styles – extending beyond the linguistic and

mathematical intelligences upon which most education programs are based (Murfee, 1998).

We have now come to recognize the need for a more pluralistic view of literacy. Terms such as “multiliteracy,” “multimodal literacy” and “new literacy” signify the shift from traditional notions of literacy education to more intertextual and interdisciplinary concepts, where learners engage in a rich range of expressions, involving a scope of symbols and symbol systems (Morin, 2006). The literate individual, once narrowly defined as someone who could read and write, is one who learns through multiple ways of knowing and thinking (bodily-kinesthetic, visual, aural), uses a full range of representational texts for constructing and sharing meaning (poems, songs, dances, video, digital stories, photographs), and learns about and through all sign systems (language, music, visual art, drama and dance) (Morin, 2006). Literacy in the arts exercises learners’ multimodal problem solving skills, and requires them to approach problems from multiple perspectives, drawing on a complex symbol system to communicate their ideas. Producing and responding to artworks develops students’ critical and creative thinking processes: students communicate through the many “languages” of the arts, exploring possibilities through their imaginations. Students learn that there are multiple ways to solve problems, and they draw on different symbol systems to determine how best to communicate their intentions.

Provincial education authorities suggest that artistic literacy contributes to children’s success in school, and enriches their lives individually, and as members of the broader community.

Learning through the arts enables students to rely on imaginative and creative processes, promotes open-ended, non-linear thinking, and encourages understanding and feeling mediated through the senses. It requires openness to

new ideas, connections, and ways of seeing—a spirit of inquiry and exploration that leads to independent learning. An arts education provides balance in the overall school curriculum by developing many ways of knowing and by enhancing understanding of our cultures and ourselves. (MEY, 2003, p. 4)

By acknowledging the arts as important ways of knowing, and recognizing their importance as part of a balanced, multiliteracy education, we elevate their role in the school curriculum (Morin, 2006).

The arts provide fertile ground for sowing the seeds of creativity. According to Arnold Aprill (personal communication, July, 2007), former Executive Director for the Chicago Arts Partnership in Education, as the world moves from industrial to knowledge-based society, learners need to be educated in ways that move them from being receivers of knowledge from centralized sources into becoming creators of knowledge negotiated between multiple sources. This requires learners to develop their creative capacities and multiple literacies. The arts expand students' creative capacities, enabling them to be more fluent, flexible, original, elaborative and willing to resist closure (Burton, Horowitz & Abeles, 1999). Every child has the yearning and capacity to express themselves artistically. Each child plays, imagines, sings, dances and creates art to make sense of their world and to celebrate their place in it. They use the languages of these art forms to communicate with one another before ever learning to read or write. Arts education requires learners to draw upon their innate creative abilities, and deepen them as well. The ability to think creatively is a skill that lasts a lifetime, and can be extended and applied to endeavours throughout our lives.

Schools that incorporate dance, drama, visual art and music in their curriculum have found that teaching the arts has a significant effect on students' overall success in school. A

major study included in E.B. Fiske's (1999) research compendium *Champions of Change* investigated the impact of arts learning experiences on students in grades 4-8. The study found that students who participated in arts-rich schools:

... performed better than those in "low-arts" groups on measures of creativity, fluency, originality, elaboration and resistance to closure – capacities central to arts learning.

Pupils in arts-intensive settings were also strong in their abilities to express thoughts and ideas, exercise their imaginations and take risks in learning. In addition, they were described by their teachers as more cooperative and willing to display their learning publicly. (Burton, Horowitz & Abeles, 1999, p. 36)

The benefits of arts learning are also illustrated in *Critical Links: Learning in the Arts and Student Academic and Social Development* (Deasy, 2002), a compendium of 62 arts education studies and essays, published by the Arts Education Partnership. The studies included in *Critical Links* revealed strong relationships between learning in the arts and important cognitive skills and competencies used in learning other school subjects such as reading, writing and mathematics. Furthermore, the studies reported that the arts nurture non-academic skills, particularly those skills important for social interaction, including empathy, collaboration and tolerance for others. The studies also explored positive attitudes toward learning developed by studying and practicing the arts. Student engagement, increased attention and persistence at tasks were among some of the attitudes mentioned in the studies.

Arts Integration

Many educators realize the power of the arts to inspire, motivate and engage their students, and understand their importance within a balanced education program. Meaningful integration of the arts with other subjects is an approach many educators have adopted.

According to Annenberg Media (n.d.), when we teach core curriculum *through* the arts, we enable students to: (a) discover the interconnectedness of our world; (b) deepen understanding of the big ideas that transcend individual disciplines; (c) engage in artistic processes of creating, performing and responding; (d) think, communicate, and share through multiple sign systems; and (e) solve problems creatively by drawing on knowledge and methods from various disciplines.

A large body of research illustrates the power of an arts integrated approach, particularly with disadvantaged populations (Catterall, Chapleau & Iwanaga, 1999). Ingram and Riedel (2003) reported a “significant relationship between arts integrated instruction and improved student learning in reading and mathematics,” (p. iv) and point out that in some cases, “the relationship between arts integration and student achievement was *more powerful* for disadvantaged learners, the group of students that teachers must reach to close the achievement gap” (p. iv). Arts integrated programs appear to have more powerful impact on the academic achievement of struggling students than the traditional arts education programs do (Catterall & Waldorf, 1999; Rabkin & Redmond, 2006), revealing that those students who previously struggled with academics in conventional classrooms thrived in the arts-integrated milieu (Rabkin & Redmond, 2006).

A large body of scientific evidence reveals that learning is advanced and accelerated by connections among disciplines. Leading educational brain research experts such as Eric Jensen (1998, 2001) and Robert Sylwester (1995, 1998) argue for an integrated approach to learning, and explain that the arts promote the development of human neurobiological systems. “From fine-tuning muscular systems to integrating emotion and logic, the arts have important biological value. For their unique contributions to brain development, the arts must take center

stage in schools” (Sylwester, 1998, p. 31). Several research studies have examined both stand-alone arts programs, as well as arts integrated programs. An interesting finding of these studies is that the most powerful effects on student learning are found in programs that integrate the arts with other subjects across the curriculum. Researchers suggest that arts integration promotes conditions that are ideal for learning (Sousa, 2006), thereby enhancing the learning process. The neurological systems nourished by the arts include our integrated sensory, attentional, cognitive, emotional and motor capacities, and are the key operational forces behind all other learning (Jensen, 2001).

Many teachers at our school have adopted an arts-integrated methodology, and have observed higher levels of engagement in their students as well as improved attendance. Teachers have also found that employing the arts as the medium through which core curriculum concepts are addressed honours students’ multiple intelligences, affording them meaningful opportunities to construct and share their understanding in non-traditional ways. Teachers of arts integrated programs have also reported gains that extend beyond students’ academics: increased energy levels, higher morale, willingness to take risks and collaborate with colleagues, which in turn lead to a more positive school climate (Rabkin & Redmond, 2006).

While teaching *through* the arts has proven to be a successful strategy at our school in reaching hard-to-reach students, our teachers also teach *in* and *about* the arts, implementing the four essential learning areas from the *Arts Education: Draft Manitoba Curriculum Frameworks* (MECY, 2007). These four big areas encompass: arts language and performance skills, creative expression, arts in context, and valuing arts experience. Each arts discipline (dance, drama, music and visual art) is characterized by distinct forms, each employing a range

of unique media (MEY, 2003). While visual art and music are the dominant art forms practiced at our school, teachers also experiment with drama and dance, honing their teaching in these art forms through ongoing professional development opportunities and Learning Through the Arts artist visits.

In December, 1993, American philanthropist Walter Annenberg announced a \$500 million “Challenge to the Nation” to be funded through the Annenberg Foundation. Proposals submitted were focussed on “the unique role of the arts, culture and technology in accelerating and expanding school reform efforts and helping children succeed in school.” (“National Initiative,” 1995, n.p.). Two years later, the Galef Institute was granted a \$10 million challenge grant to administer a new program, The Arts, Culture and Technology Initiative promising to reflect its research that, when used as tools for learning, the arts and technology provide some of the most powerful ways to keep children motivated to learn and to raise their levels of academic achievement. Pitman (1998) echoed this research, arguing that when the arts are combined with the full range of media and communications technology and infused into all aspects of teaching and learning, children become fully engaged. Today, sixteen years after Annenberg’s call for arts education reform, the arts and technology hold their place in the school curriculum as some of the most powerful tools to engage, motivate and inspire our youth.

Technology as an Enabling Tool in Arts Education

Much research has been dedicated to the transformative potential of ICT in education. What are ways technology can support learning in an arts education program? When Elliot Eisner (2004) asked “What Can Education Learn from the Arts about the Practice of Education?” he presented a provocative lens through which to look at new ways of

conceptualizing education. Eisner proposes a new vision of education, one that is influenced by the values and ideas of Sir Herbert Read (1944), who suggested that “the aim of education ought to be conceived of as the preparation of artists” (p. 4) – through the development of ideas, sensitivities, skills and imagination to create work across all disciplines. Avril Loveless (1999) uses Eisner’s framework to draw attention to the connection between our aims in arts education and the use of digital technologies. Using Eisner’s six distinctive forms of thinking in the arts, Loveless summarizes and connects each form of thinking with its implication for learning with ICT:

- Composition – the ability to compose qualitative relationships that have some purpose, pay attention to and make judgements about how qualities are organised and reflect a ‘rightness of fit’. *What roles might digital technologies play in developing approaches to composition, feel, fit, nuance, attention and judgement?*
- Flexible purposing – the recognition that in formulating aims, the ends need not precede the acts, and that purpose might emerge through response, dialogue and a readiness to exploit surprise. *How does the provisionality and adaptability of ICT encourage and support recognition of serendipity and dialogue between the maker and the made?*
- Recognition of the inseparable relationship between form and content. *How do the affordances of multimodality, non-linearity, capacity, range and mobility pose challenges for new media literacy and communication?*
- Conceptions of mind – the acknowledgement that, as Polanyi remarks, “We know more than we can tell”, and our expression of meaning moves beyond

the word. *How does ICT enable us to make connections between words, sounds, images and gesture and make meaning?*

- Mediation – understanding of the interaction between thinking and the material in which we work, and acknowledgement of changes in the nature of tasks and criteria for appraisal. *How is ICT used as a medium and a tool in arts practice and ‘mind as a cultural achievement’?*
- Motivation – the ‘sense of vitality and surge of emotion’ that is associated with engagement and aesthetic satisfaction in our work. *How does ICT play a role in motivation, engagement and ‘flow’?* (p. 2)

Loveless’ elaboration on Eisner’s framework helps us to thoughtfully consider and assess uses of technology as they relate to our students’ forms of thinking. This framework was used in this action research study to help teachers reflect on their practice and students’ learning with ICT.

As arts educators, we recognize the importance and value of working with *real* media (paint or clay, musical instruments and our own bodies) and cannot deny the significance of a real-life, hands-on, multisensory approach. ICT should never serve as a substitute for a hands-on approach with real media. ICT can, however, support, extend and enhance the creative work that goes on in an arts education program. ICT can be seen as a unique set of tools which can be chosen *as* and *when* they are appropriate in the creative process (Loveless, 2002a). Loveless argues that ICT can also make a distinctive contribution to the creative process, offering new tools, media and environments for learning to think and act creatively. She goes on to suggest that teachers and students “can use ICT to support imaginative expression, autonomy and collaboration, fashioning and making, pursuing purpose, being original and

judging value” (p. 2). In another report, Loveless (2002b) presents several key features of digital technologies that can support and extend learning: (a) provisionality, (b) interactivity, (c) capacity, (d) range, and (e) speed. Conole and Dyke (as cited in Fisher, Higgins & Loveless, 2006) expanded this list to include features that are more characteristic of the postmodern age: (a) accessibility, (b) speed of change, (c) diversity, (d) communication and collaboration, (e) reflection, (f) multimodality and non-linearity, (g) risk, (h) fragility and uncertainty, (i) immediacy, (j) monopolization and surveillance. Such features afford students and teachers with opportunities to be creative in authentic contexts, and accomplish a variety of tasks that may not have been possible using traditional tools. Recognizing the potential of these features makes it possible for teachers and their students to make decisions about how, when and where to use ICT (Fisher, Higgins & Loveless, 2006). These features will now be discussed within the context of the arts education program.

As new technologies become available, artists learn to use them as tools, and traditional forms of expression are reinvented, entirely new forms are created (Olejarz, 1996; Radycliffe-Thomas, 2008). When used as a tool for learning, ICT can be a catalyst for creativity. Many software programs, interactive media and websites encourage active experimentation – a key stage in the creative problem solving process. Programs such as *Adobe PhotoShop*, *GarageBand*, *iMovie*, *PhotoStory* and *Paint.net* (open-source software) allow students to explore, experiment and test out ideas in non-linear, non-traditional ways. ICT empowers students, and gives them greater autonomy over the creative process (Qualifications and Curriculum Development Agency, 1999a). ICT also provides a greater range of tools to help students learn the language of the arts. For example, ICT can help students to develop ownership as they choose from a diverse range of interesting tools; and the technology can

keep up with the speed of ideation as students quickly and fluently develop new ideas (Gast, n.d.). Students can experiment and take risks and explore a wide range of possibilities, saving their work along the creative path, undoing “mistakes” easily (Torjussen & Coppard, 2002). A characteristic of digital technology is its potential to be exploited and experimented with to support the creative process (Loveless, 2002a). Experimentation and risk-taking, also key stages within the creative process, are naturally promoted within many software programs, inviting students to “muck about” and explore novel or unconventional approaches. Students learn new ways to publish, present and communicate meaning, supporting the many avenues for creative expression (Gast, n.d.).

ICT enables students to make changes, try out alternatives and ‘trace’ the development of ideas (Loveless, 2002a). While generating and testing out their ideas, students save their work at several points along the creative path, allowing them to take risks without the possibility of ruining their work. The process of risk-taking is facilitated through the use of ICT: students who would not normally feel confident to experiment and improvise with real materials feel comfortable in the safety that a virtual environment provides, knowing one can always “undo” her last mistake. A teacher describes the process of risk-taking for her students in a digital art project involving photo editing:

When the pupils previously used traditional techniques such as wax resin or batik, it was often difficult for them to predict final results and impossible to undo a disaster without starting again from scratch. However, using ICT enabled the pupils to experiment freely and manipulate images easily, secure in the knowledge that they could revert to a previous stage in their work. (Qualifications and Curriculum Development Agency, 1999b)

ICT, then, provides students with new avenues for self-expression, a safe milieu to experiment with ideas, and a platform to produce interesting products. However, more important than producing impressive compositions, ICT can be utilized to teach children about the creative process itself. *Adobe PhotoShop*, *iMovie*, and *GarageBand* are examples of how ICT can teach students about real-life creative problem solving. Such programs encourage students to generate ideas, create, edit, revise and enhance their work with the same tools used by professional artists. Students are empowered to express their ideas creatively – through words, images, video and sound – ways that honour students’ multiple literacies that would not be possible through traditional media. Open-ended programs encourage students to think divergently to explore and exploit the program’s creative uses. Such exploration often yields unexpected results – outcomes that are embraced in the arts (Eisner, 1967). Artists grow and stay inspired through play, experimentation and practice. Unexpected outcomes and serendipity are embraced by artists as valuable opportunities to learn (Eisner, 1967).

Constructivist arts programs call for a student-centered, inquiry approach to learning. Through the inquiry process, children plan and question, gather and make sense of ideas, produce to show understanding, and later communicate to share their understanding with others. ICT naturally supports the inquiry process, as students actively engage in establishing and pursuing their own learning objectives through questioning and individual interests (MECY, 2006). Students gain greater independence as they select materials and programs that suit their needs. Students become self-initiated learners, as they take ownership and responsibility over their learning. Interactive websites, multimedia presentation tools, online informational videos and virtual libraries put students in control, rather than their teachers, and allow students to research topics in the arts in a flexible manner that are suited to their level of

understanding and learning pace. Such programs “can put the power of learning in the hands of the student and can change the role of the teacher from a detached dispenser of information to the exciting and challenging role of manager, facilitator, or guide” (Gregory, 1995, p. 9). In authentic technology-infused classrooms, teachers become facilitators, who assist students in constructing their own meaningful and personal knowledge bases. ICT in an arts education program encourages students to take responsibility for their own learning, as they choose tools to best support their needs to construct personal meaning.

In the planning, questioning, and idea generating stage of the creative process, students can use portable digital microphones, cameras, scanners, and video cameras to collect ideas and record observations in addition to traditional sketchbooks or journals. The flexibility and freedom afforded to students through ICT provides alternate avenues to communicate ideas and share understanding. For example, those students who are not strong writers have an opportunity to share ideas orally through voice-recorded podcasts, digital stories, or video.

Web 2.0 tools such as *Skype*, *Slideshare*, *Wikis*, *Ning*, *VoiceThread*, *YouTube* and *Flickr* afford arts educators and their students new and engaging tools to communicate and share ideas with others across the globe. New opportunities are created for students to engage in reflection about their work as artists, as they participate in discussions in virtual arts communities with peers all over the world. New communication technologies offer new possibilities to connect across space and time (Radclyffe-Thomas, 2008). Such communication tools open new doors for the advocacy and implementation of arts education practices (Creating Spaces, 2003; Texas Commission on the Arts, 2001). Greater access to artists and their work presents new opportunities for aesthetic valuing (see <http://www.ArtsAlive.ca>), and “virtual field trips” allow free and immediate admission to renowned galleries and museums

worldwide (see the Museum of Modern Art -<http://www.moma.org/>, and the National Gallery of Canada - http://cybermuseum.gallery.ca/cybermuseum/home_e.jsp and <http://www.nga.gov/>)

Arts teaching is enriched and enlivened through immediate access to online art galleries, museums and professional artists, video-taped dance works, and film productions, affording students with opportunities to construct meaning in authentic ways. Electronic portfolios and online galleries (see <http://www.artsonia.com/>) showcase young artists' work with a global audience, contributing to their growth as artists and learners (Texas Commission on the Arts, 2001). Web 2.0 tools such as blogs, podcasts and wikis afford students with tools to collaborate, share and reflect on their learning as young artists.

ICT has the potential to enhance real world experiences through collaborative communities of practice. Developments in virtual technologies are creating new and exciting approaches to arts learning and teaching that have never been conceived of before, where real and simulated electronic environments can interact in virtual worlds of practice, and where creativity has the potential to be artistically explored, shared with others, in the widest possible range of learning contexts and environments" (Dunmill & Arslanagic, 2006, p. 11). One example of a virtual community of practice, is ArtEd2.0, a social network developed and maintained by Dr. Craig Roland, professor of Art Education at the University of Florida. Roland (2007) used Web 2.0 tool *Ning* to design this social network "for art educators at all levels who are interested in exploring applications of new technologies in their teaching and classrooms" (Roland, April 10, 2007). The social network offers art educators a virtual space to connect with one another globally, and provides a forum for collaboration and sharing of ideas. ArtEd 2.0 has over 3,500 worldwide members who contribute daily through blogs, online discussions, photographs and video.

Despite rich potential for ICT to enhance arts education programmes, research from the field presents minimal and uneven use in arts classrooms compared with traditional curricular areas (Dunmill & Arslanagic, 2006). How can we help teachers adopt new technologies to support and extend arts education practices? What kinds of professional development programs support teacher change in the infusion of ICT within an arts education program?

Effective Professional Development

What models of professional development work? There is an established recognition in the field of education that educators must continually hone and reshape their knowledge of teaching and learning. This knowledge is first cultivated in teacher education programs, and then becomes part of teachers' lifelong learning process, through continued professional development opportunities and reflective practice (Farrell, 2008). According to Ross, Rolheiser, and Hogaboam-Gray (1999), "the key to professional growth is inquiry. For teachers this once meant implementing the findings produced by expert researchers. Now it means teachers becoming researchers, inquiring into their practices for purposes of professional renewal" (p. 255). Models for professional development have shifted toward more constructivist approaches, including reflective practice and action research methodologies (Farrell, 2008). Such models present ways for teachers to "change and move toward their own carefully articulated goals to improve their schools, their relationships with each other and the teaching processes for students" (Sideris & Skau, 1994, p. 40). Current constructivist notions on the professional development of teachers maintain that teachers should be actively pursuing their own questions and dilemmas, reflecting critically on their practice to construct new knowledge and theories about content, pedagogy, and learners, building upon their own

knowledge base, and interacting within a social context (Ball & Cohen, 2000; Brooks & Brooks, 1993; Darling-Hammond, 1998; Rock & Levin, 2002).

The American Educational Research Association (AERA) (2005) published an article in *Research Points: Essential Information for Education Policy*, titled “Teaching Teachers: Professional Development to Improve Student Achievement,” which presented key research findings to help shape policy for the professional development of teachers. Studies in the article suggested that “teachers are more likely to change their teaching when professional development is directly linked to the program they are teaching” (p. 3), and that “teacher professional development can improve student achievement when it focuses on teachers’ knowledge of the subject matter and how students understand and learn it” (p. 3). The article also addressed the need for prolonged engagement in professional development: “the more time teachers spend on professional development, the more significantly they change their practices,” (pp. 2,4) and that “participating in professional learning communities optimizes time spent on professional development” (p. 4).

Models for effective professional development share several characteristics. Darling-Hammond & McLaughlin (1995) suggests that such models tend to be: (a) experiential – connecting teachers through hands-on tasks of teaching, assessment and observation that clarify the processes of learning and development; (b) inquiry-driven - founded in teachers’ questions, inquiry, and experimentation as well as research in the field; (c) collaborative, involving dialogue and sharing of knowledge among educators; (d) connected to and growing out of teachers’ work with their students, as well as exploration of subject matter and teaching methodologies; (e) sustained and rigorous, supported by modeling, coaching and problem

solving around specific issues or dilemmas in practice; and (f) linked to other elements of school change.

Teacher Learning

In developing a professional learning model for teachers, we must first understand how teachers learn. Constructivist theory plays a significant role in understanding teacher learning. Ball (1996) offered nine factors which influence teacher learning. These were: (a) teachers' prior beliefs and experiences and how these experiences shape their professional learning; (b) subject-matter knowledge, where the teacher's own command of the subject determines her ability to teach for understanding; (c) knowing the students, hearing and understanding their perspectives on learning are thought to be essential when teaching for understanding; (d) importance of the context (inner city, rural, private or public education), and understanding how these factors can inhibit and facilitate teachers' efforts; (e) competing demands on time, when adopting new ideas and practices requires revising deeply held notions of learning and knowledge; learning to develop new ways of teaching, to reflect and assess one's work takes time, and is a complex process; (f) reflecting on practice in ways that facilitate their learning, through dialogue, reflective journals, or by engaging in action research; (g) follow-up on training through long-term support, in the form of coaching or ongoing interaction with colleagues; (h) modeling of new approaches through peer mentors, staff developers and teacher educators; and (i) teacher control of the agenda, determining the nature and focus of the programming offered.

While these ideas are fairly general, and do not address a particular kind of teaching, they are useful considerations for the structuring of teacher education (Ball, 1996).

The factors presented by Ball suggest that the teacher's context is crucially important in designing professional development models: professional development cannot exist in a vacuum (Schifter, 2008). The nine factors impacting teacher learning are interdependent and interrelated, and the development of a professional learning model should address these factors in a balanced and holistic manner.

Much research has been specifically devoted to investigating professional development programs to help teachers integrate technology into their practice. In a review of the literature on preparing teachers to use technology, Cradler, Freeman, Cradler & McNabb (2002) present several strategies that foster teacher confidence and interest in technology. Mentors who model best practice play an important role in changing how teachers teach. Practicing teachers benefit from working with and observing mentors who are skilled in using technology with outcomes-based curricula (Abbot & Faris, 2000). Similarly, Zhao, Pugh, Sheldon and Byers (2002) argue that mentors who can help teachers adapt technology to their specific classroom needs are critical to the success of innovative uses of technology. Teacher input is also a critical factor when designing professional development around technology. In considering teachers' perspectives, concerns and issues, we recognize and honour *teachers'* voices in order to change practice (Sandholtz, 2001). Sandholtz (2001) also pointed to the importance of a constructivist environment through active, hands-on exploration and practice within a non-threatening environment. Collaboration between teachers is crucial, and considerable time for collaborative learning and practice is needed to develop teachers' confidence levels in using technology (Coley, Cradler & Engel, 1997). Long term professional development has also been identified as critical to change teacher practice in adapting and infusing curricula with technology (Wetzel, Zambo, Buss, & Padgett, 2001). Systems such as providing blocks of

time for teachers to work and learn collaboratively, and strategies for team planning, sharing, learning and evaluating are paramount to the success of any professional learning model (Darling-Hammond & McLaughlin, 1995).

Carney (1998) examined a teacher professional learning model aimed at infusing technology into the constructivist classroom. He identified four elements which he deemed crucial for effective teacher learning: (a) challenges to frames of reference (i.e. to effect teacher change, teachers must be placed in situations of disequilibrium), (b) situated learning, (c) collaborative reflection, and (d) long-term collegial interaction and support.

A Way Forward through Action Research

A professional development model that addresses many considerations about teacher learning and is gaining worldwide respect and recognition is action research (McNiff & Whitehead, 2006). We can trace the beginnings of action research to the work of Kurt Lewin, who viewed action research as a cyclical, dynamic and collaborative process in which people tackled social concerns impacting their lives (Stringer, 2004). Lewin's (1946) cyclical model of planning, acting, observing and reflecting facilitated the process of social change, as participants took ownership of problems, and sought changes in their practice (Stringer, 2004).

Kemmis and McTaggart (1988) articulate the action research approach as:

... a form of collective, self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own social or educational practices, as well as their understanding of those practices and the situations in which these practices are carried out (p.78).

McNiff & Whitehead (2006) further expand the definition, suggesting that “[a]ction research is about practitioners creating new ideas about how to improve practice, and

putting those ideas forward as their personal theories of practice” (p. 5). In asking “What am I doing? What do I need to improve? and How do I improve it?” practitioners show how they trying to improve their own learning, and influence the learning of others (p. 7).

Action research is a powerful form of professional learning because teachers themselves investigate their own practice, as they “find ways of living more fully in the direction of their educational values” (McNiff & Whitehead, 2006, p. 8). Identifying problems or concerns in one’s own practice is the work of the action researcher, because she knows her practice best. Action research is a form of “insider research” – where the researcher is an integral and inextricable part of the study who asks: “is my/our work going the way we wish? How do we improve it?” These notions of action research illustrate the methodology’s reflective and collaborative nature, sharing the common goal of improving practice or outcomes to facilitate social change.

Challenges of Action Research

As with any research method, there are challenges associated with conducting action research. Mills (2007) describes several barriers teachers face. Time is one of the biggest challenge encountered by teachers engaged in action research. Finding the time to develop an action plan, collecting and analyzing data can be an obstacle for teachers who already feel overwhelmed by the many other responsibilities within a teaching day. Moreover, reflective time is also required to make revisions to action plans to integrate new insights and data interpretations. Teachers must approach action research not as an add-on, but rather an integral part of their practice.

Another issue around the challenge of time, particular to this action research project, involves the time required to learn new technology. Mehlinger (1997) suggests that teachers need more than 30 hours of hands-on experience and training to successfully adopt new technology into practice. Teachers require ongoing, extended training that goes beyond single, “one-shot” workshops to afford teachers with the time to explore new technology skills and applications that will help support technology integration in the future (Nudell, 2004).

Another challenge for teachers, according to Mills is the difficulty in formulating a research question. Teachers often feel disillusioned or overwhelmed with the idea of improving their practice, wanting to implement a complete overhaul of their practice, rather than focussing on one manageable aspect. Teachers need to elicit the help of a “critical friend” to help them identify a research focus and question that meets their individual and class needs. Mills also suggests that resistance to change can be an inhibiting factor for teachers engaged in action research. Support from school and school district are critical if the action research is to be successful. If teachers do not have the support they need, the action research is less likely to lead to change. In order to combat this obstacle, teachers should provide a rationale for their research, emphasizing how their study will benefit their students and school.

Types of Action Research

Action research signifies different things to different people. Bradbury and Reason (2002) consider action research as a “family” of participative, experiential and action-oriented approaches to research. According to Creswell (2005), a review of the major research contributions in education illustrates that there are two dominant paradigms of action research

that are typically discussed, participatory action research and practical action research.

Participatory action research has a social and community orientation, and a focus on research that contributes to emancipation or social change. Participatory action research can also be referred to as *community-based inquiry*, *collaborative action research*, *participatory research*, or *critical action research*. Participatory action research has an emancipatory aim in “improving and empowering individuals and organizations,” as such, it often involves work with disenfranchised populations (Lawson, 2008).

Practical action research differs from participatory action research in that its focus is on individual teachers solving classroom problems, or teams of teachers addressing internal school issues. Practical action research can take on the form of individual or team-based inquiry, but the focus is on teacher development and student learning. Practical action research espouses the “teacher-as-researcher” notion, and assumes that teacher-researchers have decision-making authority to study their own practice as part of their ongoing professional development (Creswell, 2005).

Collaborative Inquiry Groups as a Form of Action Research

One form of practical action research that has emerged as a promising strategy for the bringing about meaningful change in teacher practice is that of collaborative inquiry groups – also referred to as *cooperative inquiry* (Hughes & Ooms, 2004; Tillema & van der Westhuizen, 2006). In collaborative learning communities, small groups of teachers come together to collectively investigate pedagogical and content issues. The old adage, “two heads are better than one” underpins the collaborative inquiry approach – multiple perspectives help make sense of the complex and dynamic nature of teaching and learning.

Collaborative inquiry was inspired by the work of Heron and Reason (as cited in Goodnough, 2008), and is based upon launching cooperative inquiries into significant issues of practice. This model has been shown to improve teacher and student performance, as well as enhance professional efficacy (Sagor, 2000), and recognizes teachers as inquirers, decision-makers and generators of knowledge (Short & Burke, 1996). Teachers-as researchers are supported in a social context and are engaged in systematic inquiry about their teaching, identifying individual or common issues and dilemmas, seeking to make changes in their classrooms or schools.

As a model for professional development, collaborative inquiry provides an opportunity for teachers and administrators to examine issues from multiple perspectives, working together to find solutions to problems. Collectively, teachers engage in positive actions to improve their own practice, thus positively impacting on student learning (Burbank & Kauchak, 2003). Such a methodology has the power to promote new content knowledge, engage teachers in critical collegiality, and to create and sustain a community of inquiry (Hughes & Ooms, 2004). The collaborative inquiry approach is aimed at bringing together people with similar experiences and concerns with the focus on learning through sustained dialogue, interaction and collaboration (Goodnough, 2008; Lawson, 2008).

In traditional approaches to research, the researcher's role is that of knowledgeable expert who maintains a distance from the subjects, in order to remain objective. In such approaches, the researcher is often viewed as the initiator, director and controller of the study. According to Lawson (2008), in this traditional approach, the researcher selects the issue to be investigated, formulates and implements a plan and gathers and analyzes data in order to determine the findings. In collaborative inquiry, Reason (2002) points out that all members

involved in the inquiry are both co-researchers, whose thinking and problem-solving contribute to generating ideas, designing, implementing and managing the project, and drawing conclusions from the experience, and also co-subjects, participating in the activity that is being researched. Such an approach to inquiry views “researchers and participants as co-learners and co-constructors of knowledge, with relationships reflecting more equity among all participants” (Goodnough, 2008, p. 8). Lawson (2008) states:

In the co-researcher approach central to action research, it is not essential, nor even preferred, that the researcher or other participants remain objective. Instead, value is placed on bringing one’s own thoughts, opinions, and life experiences to the forefront of the research (p. 60).

Through the cyclical process of collaborative inquiry, teachers develop their own inquiry questions about student learning in their own settings. They do this by taking stock of what is going on in their practice, and identifying a concern. The next step is to consider a possible way forward, and trying it out. This is followed by monitoring the action, by gathering data or information, and then later reflecting on the data. Both the data and reflection are shared with others in the collaborative inquiry group to extend thinking. Teachers then modify their practice, in light of the evaluation and feedback from others within the group (McNiff & Whitehead, 2006). With this, another cycle of inquiry is born.

An example of collaborative inquiry used as a professional development model can be found in the work of Joan Hughes and Ann Ooms (2004). Their research looked at the development and implementation of a content-focused technology inquiry group, where groups of teachers met to identify problems of practice and inquire into technology-supported solutions. The collaborative inquiry approach used espoused many of the characteristics for

optimal learning, including: (a) situating teachers within their own social context where they had opportunities to collaborate, discuss and reflect with colleagues from their own school; and (b) to be exposed to alternative practices and beliefs where they could observe the positive impact of these practices on students' learning. The researchers identified four factors that were essential to the success of this approach: (a) group identity, focus and participation, meaning group members sharing a common goal, articulating a clear purpose and expectations for participation; (b) participation of a facilitator, meaning a media specialist or technology coordinator who is more knowledgeable about technological innovations than the group participants; (c) provision of time to support the process of innovation diffusion; and (d) opportunity for group members to engage in their own action research. Findings from the study support collaborative inquiry as promising approach for the professional development of teachers.

Challenges of the Collaborative Inquiry Approach

Wenger et. al (as cited in Dooner, Mandzuk & Clifton, 2008) define a learning community as a “group of people that act on an ongoing basis to develop their knowledge of a common interest or passion by sharing individual resources and by engaging in critical dialogue” (p. 565). Using this definition, then, collaborative inquiry can be considered a form of professional learning community.

Several challenges are associated with the collaborative work of a professional learning community. According to Dooner, Mandzuk and Clifton (2008), group members may struggle with their conflicting perspectives of effective teaching practice, the uncertainty related to their own professional knowledge, or with unclear interpretations of educational goals – all of which can present conflict and interpersonal tension within a professional learning community.

According to Yamraj (2008) whose doctoral dissertation is titled *The Challenges and Complexities of Initiating a Professional Learning Community of Teachers*, obstacles to sustaining a professional learning community can be classified as logistical, personal and socio-cultural. Yamraj found that logistical challenges reflected less teacher-controlled and more externally-controlled situations, such as finding the time to meet as a group and confines of the school such as deadlines and curriculum requirements. Personal challenges included more teacher-controlled actions, including attendance at meetings, dedication or commitment of group members, as well as professional attitudes. The socio-cultural challenges included conflicts that teachers encountered within the school culture, and their impact on teachers' and students' attitudes.

It is helpful to keep these challenges in mind throughout the collaborative inquiry study, as they will help to illuminate and evaluate the collaborative work of participants.

Theoretical Framework

Constructivism. This action research is guided by the theories of constructivism and social constructivism. Constructivist theorists assert that we actively construct our own understanding and knowledge of the world through our own experiences, followed by the reflection upon those experiences (Jonassen, 1994; Piaget & Inhelder, 1968). Constructivism is founded upon works of Piaget, Dewey, Von-Glaserfeld, Kant and Kuhn (Yilmaz, 2008), who believe that knowledge is not a fixed object, but rather, constructed *through* the individual as a result of her experience. Knowledge and truth are the result of perspective, and therefore, relative to the knower. Constructivist theory posits that knowledge is temporary, non-objective, constructed from within, developmental, and socially and culturally mediated (Fosnot, 1996; Yilmaz, 2008).

Although there are several variants of constructivist theory such as cognitive, radical, situated and co-constructivism (Yilmaz, 2008), they all share four common tenets: (a) new knowledge is built on previous learning, (b) learning is an active rather than passive process, (c) language is a significant component of the learning process, and that (d) learning environments should be learner-centered (Kanuka & Anderson, 1999). Constructivist theorists postulate that “learners are intellectually generative individuals (with the capacity to pose questions, solve problems, and construct theories and knowledge) rather than empty vessels waiting to be filled” (Yilmaz, 2008, p. 162). Teachers are learners and learning is a constructive process.

Constructive learning takes place both 'in the head', through the development and modification of schemas (e.g. reflection on the use of a new teaching method), and 'in the world', through interaction and discourse (e.g. discussion of that teaching method with colleagues) (Fisher, Higgins & Loveless, 2006, p. 12).

Proponents of constructivism also hold the notion that learning involves thoughtful *reflection* and *reflexivity*. We are in control of the learning process, and this process is strengthened by reflecting on our own experiences – talking and sharing about what we know, what has been learned, and how it was learned. Teachers construct their own theories as they engage in critical reflection on their practice. The relationship between the *researcher* and *research* are inextricably linked, and new knowledge is created as the research process unfolds.

Too often, our educational practices are not aligned with our beliefs about education, schooling, teaching and learning. Inquiry can help educators interrogate their educational practices and beliefs so that they are more consistent with each other. In fact, beliefs and

practices are ideally in dynamic interaction: our practices change to reflect altered beliefs and our beliefs change as we engage reflectively in practice (Short & Burke, 1996). Constructivist theory is shaping the ways in which professional development activities are structured and facilitated in many inservice settings (Rock & Levin, 2002). "Teachers must be given ample opportunities to learn in constructivist settings and construct for themselves educational visions through which they can reflect on educational practices" (Brooks & Brooks, 1993, p. 121). Current constructivist perspectives on teachers' professional learning state that teachers should be pursuing their own questions, building upon their own knowledge base and interacting within a social context (Rock & Levin, 2002).

Social constructivism. Knowing is not only individually constructed but socially constructed, influenced by our interactions with others, by communicative forms and by culture (Brooks & Brooks, 1993; Vygotsky, 1962). Social constructivists believe that learning is socially situated, and is enhanced through meaningful participation in social contexts. Proponents of social constructivist learning theory place more importance on the social aspect of learning, stressing the role of "the other" in the learning process. Lev Vygotsky, one of the key thinkers in social constructivist theory, expanded on the work of Piaget and other cognitivists, looking specifically at how social interactions and collaboration influenced learning. Vygotsky rejected the cognitivist assumptions of Piaget that it was possible to separate learning from its social context. Vygotsky believed that all cognitive functions originate in social interactions, and that learning was not just the process of assimilation and accommodation of new knowledge, but a process whereby learners were integrated into a knowledge community (<http://gsi.berkeley.edu/resources/learning/social.html>). Social

constructivists believe learning to be being mediated by language and social discourse, primary enabling tools for learning (McMahon, 1997).

The concept of collaboration is central to the co-construction of knowledge. One Vygotskian principle that has significant implications for collaborative inquiry as research is that of the 'Zone of Proximal Development' (ZPD). Vygotsky (1978) defined ZPD as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86). Through a process of scaffolding, a more knowledgeable individual provides supports to facilitate the learner's development:

Teachers, no less than other people, experience Vygotsky's 'zone of proximal development' (ZPD) in their constructive social learning with others – colleagues, students, 'trainers'. In the ZPD, the teacher learns, with assistance, that which cannot be achieved unaided, for instance through the process of coaching (Fisher, Higgins & Loveless, 2006, p. 12).

As learner-researchers, we work with teachers, students, and critical friends to deepen our understanding. McNiff & Whitehead (2006) point out that "although placed at the center of our own inquiry, the researcher is seen as in company with others in the research and in the wider community" (p. 39), always in relation with others and environment. Learning is deeply associated with our connection with other human beings.

Change theory. In the field of education, change is a ubiquitous theme: change in curriculum, policies, practices, management, structures and procedures are but a few examples of the attempts made to ameliorate the educational experience. Teachers see new approaches

come and go, and just as they become comfortable and knowledgeable with one new approach, another takes its place (Schifter, 2008). While innovations in education are well-intentioned, most come in top-down fashion (Cuban, 1986), and are frequently the decisions that are mandated by administrators or other outsiders who are not in touch with the realities of the classroom. Few attempts are ever made to enlist the help of teachers as collaborators and partners to implement change in practice (Buckingham, 2007). As a result, Buckingham indicates that change in education – if it occurs at all - comes about at a slow and incremental pace.

Teachers, who are socialized into the practice of teaching from a very young age, are creatures of habit: “the current and historical role of the classroom teacher is highly ritualized” (Hoban, as cited in Cuban, 1986, p. 61). According to Larry Cuban, continuity, rather than change, characterizes teacher practice. Teachers tend to teach in the way they were taught. We do what is most comfortable and dependable rather than taking unpredictable risks in our teaching. Teachers’ reluctance to change is noted by Rodrigues (2005):

Expecting someone to consider change requires them to speculate on the impact of that change. After all, if you have been successful in your classroom practice...then why would you engage in practices that are likely to jeopardise this success, and cause angst or disruption? For the most part, most teachers are keen to maintain the status quo, even more so, if the status quo has resulted in a degree of harmony and order (p.56).

Any level of change requires educators to accept the idea of change in their current pedagogy. While this appears to be straightforward, change is a complex, dynamic and variable process. There is no simple, one-size-fits-all, single-factor theory for change

(Schifter, 2008). There are, however, common threads that can be distilled in investigating change within its multiple layers of complexity. In examining the Continuous Practice Improvement model for infusing technology into the classroom, Catherine Schifter used several lenses to determine whether change had occurred in teachers, and to what level these changes occurred. Schifter found several commonalities in looking at a variety of change theories: (a) possessing knowledge about the innovation and the desire to learn more about it, (b) a readiness to take risks, (c) trying the innovation with students, and (d) possibly adapting it to meet students' needs. The ability to communicate the significance of the innovation or change to relevant stakeholders to enlist support is also an important factor in determining successful change. Sustaining meaningful change in taking up an innovation also involves social elements such as cooperation, collaboration, and mutual support.

In order for teachers to adopt a new innovation into their practice, first they must be shown how to *use* the innovation; they must be sure that the innovation works and that it solves a problem that is agreed to be a problem in the first place (Schifter, 2008). In the case of technology integration, David Buckingham (2007) suggests that teachers will be much more likely to adopt an integrated approach if they perceive there to be a role for the technology to promote their own pedagogic or curricular goals. He goes on to state that change is a social process, not just an individual process, and is much more achievable when teachers are strongly supported by others. Rogers, in his Diffusion of Innovation (DOI) Theory (as cited in Warford, n.d.), presented a way of predicting and explaining the adoption or rejection of new ideas and practices. He reported on the potential benefits of a systemic approach for educational reform using the theory of DOI: "An exciting potential contribution could be made by the education research tradition, stemming from the fact that organizations are

involved, in one way or another, in the adoption of educational innovations...organizational structures are inevitably involved in educational adoption decisions” (Rogers, as cited in Warford, n.d., p. 3). Rogers proposed five criteria that teachers consider in order for an innovation to be accepted into use: (a) relative advantage, or, is the innovation considered better than what is currently in use? (b) compatibility, or is the innovation compatible with the culture of the school? (c) complexity, or is the innovation simple and easy to understand? (d) trialability, or is the innovation available to be tested before adoption? and (e) observability, or can the results of the innovation be observed by others? (as cited in Schifter, p. 33) Just as Schifter used Rogers’ Diffusion of Innovations Theory to assess teachers’ integration of ICT through the Continuous Practice Improvement model, I use these criteria to examine teachers’ experiences in my collaborative inquiry action research study, using the framework as a lens through which to explain teachers’ adoption or rejection of technology.

Studies of educational change conducted much earlier by the Rand Corporation (as cited in Schifter, 2008), showed that effective strategies for implementing innovations and change in teacher practice included the following:

- concrete, teacher specific and on-going training,
- classroom assistance from project or district staff,
- observation of the project in other classrooms or districts,
- regular project meetings,
- teacher participation in project decisions,
- local development of materials, and
- principal participation in training (p. 36).

Such strategies are aligned with Rogers' criteria for diffusion of an innovation and suggest stability over time as key to facilitating change. These strategies, therefore, will be considered in the development and implementation of my collaborative inquiry action research model when I outline my innovation in greater detail.

The purpose of my action research project was to design, implement and evaluate a professional learning model that helps teachers infuse technology into their arts education practices in creative and meaningful ways. I was particularly interested in seeing if this professional learning model would inspire teacher change. How did I assess teacher change in response to the collaborative inquiry model for professional learning? Fullan and Pomfret (1977) present a model for measuring change in curriculum and instruction practices. The researchers posit that there are five dimensions of change vis-à-vis the implementation of an educational innovation: changes in (a) subject matter or materials, (b) organizational structure, (c) roles and behaviours, (d) knowledge and understanding, and (e) value internalization. I used Fullan & Pomfret's (1977) theoretical framework to evaluate and assess teacher change in practice following the collaborative inquiry model for professional development.

This chapter first presented a review of literature related to the content of the study, notably, arts education, technology as an enabling tool, and teacher professional development. The theoretical framework was then presented through a review of literature relating to constructivism, social constructivism and teacher change. The next chapter presents details on the research methodology used in this study, including data collection techniques and data analysis.

Chapter Three: Methodology

Chapter Overview

The purpose of this chapter is to provide an overall account of the research process undertaken in this study, including an overview of action research, and a description of the study's methodology, data collection and data analysis techniques. First, a description of the nested research design approach is presented, followed by a rationale for action research. Next, the innovation, participants, data collection and procedures of the study are illustrated, followed by a description of data analysis methods. In this chapter, I conclude with a discussion of the ethical considerations made in this study, as well as comments to address research quality. Finally, the limitations of the methodology are presented.

Research Design

To effect curriculum change and changes in thinking surrounding the use of technology, teachers need to take a "...critical and experimental approach to their own classrooms" (Nunan, as cited in Kervin, 2007, p. 2). Such an approach suggests teachers as action researchers who conduct research on their own practice and solve personally significant issues. The related literature, however, stresses the importance of carrying out action research within a supportive, collaborative, professional community (Crockett, 2002; Dawes, 2001). Such a process is more likely to inspire change in teaching practice. This study employed the principles of action research on two levels. First, action research served as a lens through which I investigated, evaluated and improved my own practice as an ICT mentor. In this role, I support teachers' infusion of technology across the curriculum. Second, teachers used the

principles of action research as they generated mini action plans to address individual and collective areas of concern in their practice.

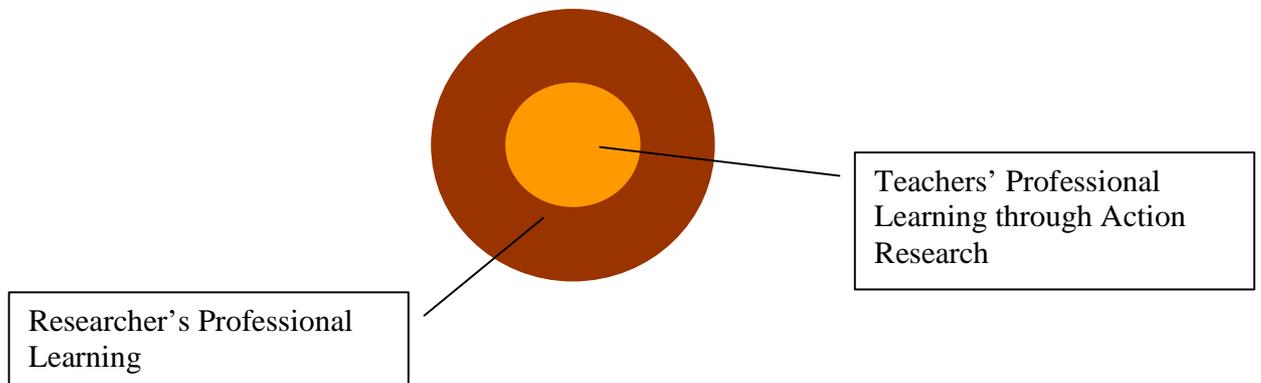


Figure 1. Nested research design approach.

My research project was based on the following assumptions about action research, as outlined by Stringer (2004):

1. **Change:** Improving practices and behaviours by changing them;
2. **Reflection:** People thinking, reflecting, and/or theorizing about their own practices, behaviours, and situations;
3. **Participation:** People changing their own practices and behaviours, not those of others;
4. **Inclusion:** Starting with the agendas and perspectives of the least powerful and widening the circle to include all those affected by the feature problem;
5. **Sharing:** People sharing their perspectives with others;
6. **Understanding:** Achieving clarity of understanding of the different perspectives and experiences of all involved;

7. **Repetition:** Repeating cycles of research activity leading toward solutions to a problem;
8. **Practice:** Testing emerging understandings by using them as the basis for changing practices or constructing new practices; and
9. **Community:** Working toward the development/building of a learning community. (p. 5)

Lawson (2008) pointed out in her dissertation that these assumptions emphasize the reflective, action-oriented, participative features which characterize action research. These features also reflect a social constructivist theoretical perspective that underpins this study.

According to Schmuck (1997), action research is a powerful form of inquiry for teachers because it is:

- Practical: practical improvements are the focus;
- Participative: teachers, administrators, educational assistants, students and parents can all be involved in meaningful ways;
- Empowering: all participants have a voice, and can contribute to and benefit from the process;
- Interpretive: meaning is constructed using participants' multiple realities in the situation;
- Tentative: there are not always right or wrong answers; rather, there are possible solutions based on multiple viewpoints; and
- Critical: participants look critically at specific problems and act as change agents. (p. 29)

This study employed the principles of collaborative inquiry, a participatory methodology that fosters both learning and generation of new knowledge (Goodnough, 2008). This approach to inquiry was “self-directed” rather than “other-directed” and invited collaborative participation in exploring and constructing different forms of knowledge through sustained interaction (Goodnough, 2008; Reason, 1989). Thus, participants were given opportunities to generate individual and shared research questions, and engaged in ongoing reflection at an individual and collaborative level, enabling shared meaning-making to emerge. The professional learning model reflected Ball’s (1996) nine considerations for facilitating teacher learning, as discussed in chapter two of this study.

Innovation

I designed, implemented and evaluated a professional learning model that used the principles of collaborative inquiry in order to support teachers’ use of technology to enhance arts-based teaching and learning. Teachers who shared a common professional development interest in ICT and arts education were invited to participate in the study. Teachers brainstormed their own issues, concerns or dilemmas and imagined ways forward, but their questions were guided so that they related to the context of arts and technology.

This project afforded teachers with time and opportunities to think, act, observe and reflect on their own and others’ practice as they experimented with and tested digital technologies in their practice. The action research provided an opportunity to learn from others, through dialogue and collaboration. Through reflective practice and critical inquiry, teachers constructed and shared their own knowledge about how their work in the arts and technology fits into educational theory (Laferriere, Breuleux, Baker & Fitzsimons, 1999).

Participants

In order to recruit participants for this study, an invitation to attend an information session was distributed to classroom teachers as well as arts specialists in our school, outlining the purpose of the project. The information session also provided an opportunity for potential participants to ask questions they may have had prior to agreeing to be part of the study. The meeting was followed by a letter, further describing the objectives and nature of the project, outlining expectations for participation in the study. Participants in the study were recruited by invitation and voluntary participation, and were asked to sign the letter indicating informed consent and their willingness to participate in the study. In essence, this is a convenience sample which “relies on available subjects – those who are close at hand or easily accessible” (Berg, 2009, p. 50). Although there are some risks associated with this sampling strategy, it is an appropriate fit for an action research study of this kind.

Timeline

The action research project spanned over five weeks, with the collaborative inquiry group meeting together initially for one full day. One week later, we met again for a half day, and a week later, for another half day. Participants were asked to stay after school during the fifth week to conclude and conduct participant-led interviews. Educational leaves were secured from the school division, providing six teachers with one full day of release time. The other day of release time for teachers came from the school’s Leadership Committee funds. Internal coverage for teachers was also provided for teacher release time on an as-needed basis.

Data Collection and Procedures

According to Stringer (2004), the major purpose of the data collection phase of the action research project is to understand the experience of interacting individuals. He suggests that the

information acquired through this process enables the action researcher to enter the world of the participants, in order to better understand and interpret events that are connected to their lived experience. In action research, the principle of triangulation is employed to confirm findings. This means that information is collected from a variety of sources, adding to the trustworthiness of the study (Wolcott, 1988). As defined by Stringer (2004), “Triangulation involves the use of multiple and different sources, methods, and perspectives to corroborate, elaborate, or illuminate the research problem and its outcomes” (p. 57).

To address triangulation Wolcott (1994) organized data sources into three dimensions, which he refers to as “The Three E’s”: experiencing, enquiring, and examining. Using “The Three E’s” ensures a balanced approach to data collection resulting in triangulation. The Three E’s are described as: (a) experiencing through observation and field notes; (b) enquiring through prompting questions, exit slips, questionnaires surveys, and interviews; and (c) examining using existing records such as archival documents, portfolios, policies, artwork, maps, audio/videotapes, artifacts, and student work samples. To ensure that triangulation could be practiced in my study, I gathered data in multiple ways. Table 1 shows a data matrix that was used to align my research questions with data sources.

Table 1

Data Matrix

Research Questions	Data Sources		
In what ways has the collaborative inquiry approach to professional learning had an impact on teachers’ learning and thinking about the use of ICT in learning in, through and about the arts?	Pre and Post Study Questionnaires Classroom and Technology Lab Observations (field notes)	Action Plans Lesson Plans	Reflective Journals
			(table continues)

Research Questions	Data Sources		
In what ways has the collaborative inquiry approach to professional learning had an impact on participants' changed practice?	Pre and Post Study Questionnaires	Classroom and Technology Lab Observations Lesson Plans	Reflective Journals
How do dialogue and collaboration foster the construction of knowledge related to teachers' integration of ICT to support their arts education program?	Pre and Post Survey Questionnaires	Interviews (audiotape)	Observations (field notes during collaborative inquiry discussions)

The five week innovation began with an introductory letter (Appendix A) and group session outlining the purpose of the research project. Participants were introduced to an overview of action research and the benefits associated with the process for professional growth. We also set ground rules to establish an ethos of trust and cooperation. I began by showing a brief video on action research to set the context for inquiry, as well as a montage of interesting arts and technology exemplars to pique interest. We discussed the purpose and objectives of the project which were: (a) develop a collection of technology-rich resources (new digital tools, Web-based curriculum materials, software/hardware applications) that model intelligent, creative uses of technology for educators and future professionals; (b) demonstrate the creative potential of ICT in an integrated arts education program through mentorship and peer modelling and scaffolding; (c) promote collaborative planning and teaching between arts specialists, classroom teachers and ICT mentors in the school; (d) help teachers become critical users of ICT in their practice, discerning when infusion is suitable in an arts context; (e) build teacher capacity through community-building and sharing of ideas; (f) encourage teachers to seek out rich, innovative “e-sources” to enhance their teaching through

the arts; and (g) provide new tools for students' creative expression and educators' creative teaching.

Participants were asked to complete a needs-assessment questionnaire that addressed their comfort and confidence levels and current pedagogy with ICT. The questionnaire explored teachers' familiarity and use of hardware, software programs, web applications, and other digital tools. Participants completed this same questionnaire at the end of the project. Next, we discussed issues of concern or interest relating to the use of technology in our practice. Teachers crafted research questions of individual interest and explored possible ways to address them. The "Timeline for Action Research Project" can be found in Appendix B and "Sample Action Research Template – Project Outline for Teachers" in Appendix C. Teachers had opportunities to dialogue about possible solutions to the questions and concerns that arose. The value of such dialogue is addressed by Haughton (n.d.) in the comments below.

On-going dialogue sessions allow participants to talk to one another as they undertake actions. Participants share perceptions, questions and concerns during dialogue. This sharing of ideas and actions leads to a *group* understanding of the work and what it means. The dialogue sessions help participants to learn from posing questions and critically examine their own experiences from a broader context. (p. x)

Teachers were invited to share their concerns and issues with the larger group in order to seek feedback and potential solutions. We used concept mapping software to chart our questions, dilemmas and potential solutions. This served as data that informed my planning for provision of next steps in the form of mini-lessons. The data also helped me to plan for modelling and scaffolding possibilities for technology to support arts teaching and learning. Teachers were asked to implement a strategy or "mini project" that would help to address their

question. We met weekly to dialogue, collaborate and mutually support one another through the action research process. We shared data and evidence of student growth, and discussed problems and potential solutions. Teachers left each session with a refined action plan which also served as data available to measure teacher growth. They identified new strategies or ideas they would test, and methods for collecting data to show evidence of student learning. We also discussed ways that I, as the technology mentor, could help support teachers in their action plans.

Teachers were invited to keep reflective journals (Gil-Garcia & Cintron, 2002) on a weekly basis, or if preferred, contribute to the secure blog site. These reflections served to guide us through our conversations, and show evidence of teacher learning. In order to explore teachers' pedagogical thinking, questions were posed: (a) What have I learned that I was not previously aware of? (b) What has been clarified for me? (c) What do I want to pursue to find out more? (d) What new skill have I acquired that I did not have before? (e) What do I understand today that I didn't before? (f) How did students respond to my lesson?

In addition to reflective journals I also collected teachers' action plans in order to document teacher change. Participants used an action research planning template (Appendix C) to record their plans, actions, observations, and reflections. At the end of each collaborative inquiry group session, participants were invited to use their action research cycle to record and/or revise action plans related to their use of technology. Participants were invited to share their plans, actions, observations, reflections, and evidence of change during the collaborative inquiry sessions.

Participants were also asked to submit a lesson plan, outlining the lesson's objectives (including the lesson's intent, the students' task and criteria for learning), the arts focus, the use

of technology, and the teacher's role. Initially, I had hoped to have teachers submit two lesson plans – one at the outset of the study, and one toward its conclusion. However, due to the timing in the school year and teachers' busy schedules, it was only possible to collect one lesson plan from each teacher-participant.

Finally, after completion of the study, teachers participated in an interview matrix technique which I facilitated. Five key questions were crafted in order to ascertain the effectiveness of collaborative inquiry as an approach to professional development. Each teacher was responsible for one research question, and was given time to record their own responses to the question, and to interview other study participants to collect information related to the research question.

Data Analysis

Shagoury Hubbard and Miller Power (1993) suggest that “data analysis is a way of seeing and then seeing again. It is the process of bringing order, structure and meaning to the data, to discover what is underneath the surface” (p. 65). Data analysis involves reflecting on the information gathered, and transforming the data into a compact system of ideas and concepts that can be applied to solutions to the problem at hand (Stringer, 2004). In action research, the researcher sifts through the accumulated data to distil the information that is most relevant to the problem being investigated. Stringer says “This process of distillation provides the material for an organized set of concepts and ideas that enable them to achieve greater insight, understanding, or clarity about events of interest” (p. 97). The intent is to achieve sound solutions to problems by uncovering concepts and ideas that make sense to the stakeholders involved.

As qualitative data were analyzed throughout the study, trends, patterns, connections and commonalities began to emerge from interviews, collaborative inquiry session field notes, lesson plans, reflective journals, action research cycles and questionnaires. These trends and patterns enabled me to achieve greater insight and clarity about the collaborative inquiry and teachers' experience (Stringer, 2004). In order to interpret and make sense of the qualitative data, I employed interpretive data analysis strategies as outlined by Hesse-Biber and Leavy (2006). First, I prepared the data, to determine exactly what I would analyze. I colour-coded data according to data source. The next steps involved data exploration and data reduction. I attempted to sort the data according to research questions. Next, I unitized the data, dividing it into units of meaning or codes. These units of meaning were identified with single-word descriptors, aligned with corresponding page and paragraph numbers from the data source. Next, I sorted the units of meaning and formulated categories which were cut up and housed in envelopes. This tactile activity enabled me to recognize themes and identify patterns, connections and commonalities within the data. I organized these themes in a table in order to summarize, make meaning and ultimately, answer my research questions (Stringer, 2004).

Since collaborative inquiry aims at honouring the voices of participants, it was imperative to ensure that participants' voices were reflected through data collection and analysis. In order to respect this principle, I modeled Lawson (2008) whose participants' compelling oral and written remarks, quotes and anecdotes were collected to illustrate and support the findings of the research study. I expected that my analysis of participant voice would give rise to what Stringer (2004) refers to as "epiphanies and illuminative experiences" (p. 96), powerful moments of knowledge construction or enlightenment.

The pre- and post-study questionnaires contained quantitative and qualitative data. As the participant group was small in size, quantitative data from the questionnaires were analyzed using descriptive statistics to determine participants' changed attitudes, views and perceived needs. Mean scores for each item on the questionnaire were calculated and then compared at the end of the study to determine overall trends. Qualitative data from the questionnaires were analyzed using a coding strategy to identify overarching themes and patterns related to the research questions, and guided my planning for subsequent mini-lessons and hands-on exploration time for teachers.

Information gleaned from the pre-study questionnaires was later compared with the results from the post-study questionnaires to compare growth and change in teachers' perceptions about their pedagogy with ICT. During group dialogue sessions, I took field notes from my observations and impressions of discussions. This provided supporting information related to the primary issues and needs of teachers, and illustrated how dialogue and collaboration play a role in knowledge construction.

Participants were asked to respond to prompting questions in their reflective journals. Participants' responses served as an indication of teacher learning, and were analyzed against Fullan & Pomfret's (1977) framework on change theory.

I also collected artifacts, such as teachers' lesson plans and action plans. At the outset of the study, I designed a rubric to analyze teacher's lesson plans. Due to end-of-year timing and demanding schedules, it was not a realistic expectation to have teachers complete a formal lesson plan. Consequently, I used the rubric as a guide and analyzed teachers' records of planning in a more holistic manner, in order to identify general trends of increased, meaningful technology use. Throughout the study, teachers' action research plans were gathered and

analyzed for trends and patterns related to evidence of change in professional practice, as teachers had the opportunity to revise their planners throughout the course of the inquiry process. The data collected and analyzed were coded to establish emerging categories. I used Fullan and Pomfret's (1977) model as a lens to analyze key indicators of change.

Ethical Considerations

In conducting an action research project with my colleagues, close attention was given to ethical considerations. As a researcher-participant in the study, I was a peer in the action research process. However, there were times I may have been perceived as having “power over” my colleagues setting myself apart from the group as I collected data and recorded my observations in the form of field notes. As a teacher-leader in the school, it was important for me to establish a climate of equality, warmth and responsiveness, so that participants would not feel undue pressure or stress. Ultimately, participants' perceptions of my role may have influenced some of the data gathered, which will be discussed in the limitations section in the pages following.

Ground rules for mutual respect, trust and confidentiality were discussed at the outset of the study. Participants' confidentiality and duty of care were considered at all times. Steps were taken to ensure that all information shared by participants were kept private – including their identities, and data shared only with permission from participants. Duty of care was practiced in storing all information securely, in locked filing cabinets. Sensitivity to participants was maintained through ongoing dialogue, as participants were given time to talk and share teaching events in a mutually supportive environment. Written permissions from all participating members were obtained. Protocols for informed consent were followed (Stringer, 2004). All participants in the study had a voice and were encouraged to share their ideas freely

and openly. The development of the work remained visible and transparent to suggestions from other participants. Findings were verified with participants by member checking and permissions were obtained for disseminating and presenting findings publicly. Participants were thanked and copies of research findings shared with those involved in the project (Curry, 1996; Morin, 2008).

Research Quality

To ensure that my action research study was valid, I used Anderson, Herr, and Nihlen's (as cited by Mills, 2007) criteria: democratic validity, outcome validity, process validity, catalytic validity, and dialogic validity. Democratic validity refers to accurate representation of all participants in the study. In assuring democratic validity, I took care that all participants' views, voices and perspectives were honoured and heard. Outcome validity requires that the actions emerging from the study lead to the resolution of the issue being investigated. My study demonstrated outcome validity, as there were action plans on two levels: those of the teachers taking thoughtful action with their students, as well as my own action steps, in helping me to better serve those teachers with whom I work. Process validity was achieved as the study was conducted in a dependable and competent manner, ensuring that data collection techniques addressed and answered research questions. Process validity was considered, as I continuously reflected on the suitability of my data collection methods through journaling and informal observations, ensuring that they were the appropriate techniques in answering my research questions. Catalytic validity refers to the willingness of participants to take action as a result of newly generated knowledge from the study. The study demonstrated catalytic validity, as it indeed led to teacher change. Teachers learned new ways to meaningfully infuse technology into their repertoire. Also, due to its success, the collaborative inquiry project has

the potential to serve as a model for future professional development within our school and school division. Dialogic validity refers to the value of the research once applied to the peer review process. Dialogic validity was addressed by sharing and disseminating the findings of the study with my colleagues and the wider professional community after public critique.

Limitations of the Methodology

The findings of this study may not be generalizable, due to the narrow geographic context (our school) and small number of participants in the study (five). Although this study presents important insights in order to foster the development of effective teaching practices and professional development models, these insights are specific to one unique context (Stringer, 2004). Readers may find, however, that the ideas presented transfer to similar contexts and may be applicable.

The relatively short time frame given to implement new strategies (five weeks), coupled with problematic calendar timing for the project (end of the school year) also presented limitations, and must be taken into consideration when considering the findings. If the collaborative inquiry project had spanned over an entire academic year, and participants in the study were given more time to explore and experiment with new technologies with more time to implement new strategies in their practice, this study might have yielded more meaningful results vis-à-vis teacher change. Also, due to the short span between collaborative inquiry sessions (one week), teachers had relatively little time to collect and reflect purposefully on their own data. Therefore, one limitation was maintaining rigour in the data gathering process of teachers' action research studies.

As technology mentor for the group of teachers involved in this study and facilitator for this collaborative inquiry project, I was well-known to all participants in the study. Therefore, the researcher and participants had a pre-existing relationship. Although this familiarity

produced a comfortable, relaxed and informal atmosphere, and teachers were very willing and keen to participate in all aspects of the project, it also posed potential limitations and ethical considerations. It is possible that teachers were somewhat biased in their reflective journal responses, questionnaires and their answers to the interview questions due to the fact that they were trying to please the researcher. Participants might have been more candid in their responses about the collaborative inquiry approach if the researcher had been unknown to them.

Another limitation posed by the action research study involved the range of ICT proficiency levels amongst participating teachers. All teachers participating in the study arrived with varying experience and abilities with technology. Teachers who were more technologically fluent might have had more confidence and success with implementing new strategies than those who had limited prior exposure to technology. The wide range of abilities made it very difficult for me to plan and present mini-lessons that would suit everyone's ability levels and unique interests and needs. Frustration levels mounted amongst a few participants when they began to feel "left behind" by the complexity of steps involved, or when digital tools seemed unrealistic or out of reach. This frustration was felt by all group members, and led to me to slow down in my demonstrations and explanations, to the point where some participants may have felt bored or uninspired.

Yet another limitation in the study concerned the unique nature of dialogue. As a researcher and facilitator, it was problematic to capture the dialogue sessions' true essence. Observations in the form of short-hand field notes were less than adequate in portraying participants' expressions and tone of voice, nor could I possibly capture every word exchanged. As a result, meaning may have been lost in the process of data analysis. This

shortfall may have been resolved through the use of audio-visual recording equipment, enabling participants' voices and true meaning to surface. To compound this problem, I analyzed and interpreted the data alone, so no inter-coder reliability was possible.

Finally, due to the inherent bias and subjectivity of action research, my perspective - drawn from my unique experiences as a technology mentor teaching at an inner-city school - will likely have influenced the interpretation of data, shaping the findings, conclusions and implications of this study. Also, my relationship with the teacher-participants involved in this study coupled with my own personal assumptions, may have given rise to researcher bias. Action research does not seek to hide these biases, but rather, aims to construct a holistic understanding of the dynamic and complex social world of the classroom and school (Stringer, 2004).

Conclusion

The aim of this chapter was to provide an overview of the action research design methodology employed including a discussion of the innovation, participants as well as description of data collection and procedures in the study. Data analysis methods, ethical considerations and research quality of the study were discussed. Finally, the limitations of the methodology were presented. Chapter Four explores the findings related to collaborative inquiry as a model for professional development in order to support teachers' use of technology to enhance arts-based teaching and learning

Chapter Four: Results and Discussion

Chapter Overview

This chapter presents the findings of the study which were based on an analysis of data sets drawn from various sources including: (a) field notes, (b) reflective journals, (c) interviews, (d) lesson plans, (e) action research cycles, and (f) questionnaires. The approach will be to present emergent themes and specific data related to each of my research questions. In addressing each question, I first display the relevant themes in Table 2 as a way of orienting the reader to the discussion that follows. Then, an integrated approach to the data is used to provide a holistic representation of the results.

Table 2

Emergent Themes by Data Source

Interviews	Field Notes	Lesson Plans	Action Research Cycles	Questionnaires	Reflective Journals
Immediate application to practice	Peer coaching	Evaluating technology with pedagogical intent	Individualized professional development	Increased confidence and efficacy	Time and support for exploration
Increased confidence and efficacy	Increased confidence and efficacy	Changes in subject matter and materials		Sustaining learning over a longer term	Reducing isolationism
Constructivist learning environment	Access to technology resources	Increased knowledge and understanding about innovation		Individualized professional development	Fostering reflective practice
Social learning	Long-term, sustained learning	Changes in roles and behaviours		Constructivist learning environment	Changes in subject matter and materials
Collaborative dialogue	Evaluating technology with pedagogical intent			Collaborative dialogue	Increased knowledge and understanding about innovation
Sustaining learning over a longer term	Changes in organizational structure			Social learning	Advancing understanding
Evaluating technology with pedagogical intent	Changes in roles and behaviours			Changes in subject matter and materials	Fostering divergent thinking
Fostering reflective practice	Increased knowledge and understanding about innovation			Changes in organizational structure	(table continues)

Interviews	Field Notes	Lesson Plans	Action Research Cycles	Questionnaires	Reflective Journals
Individualized professional development	Value internalization			Increased knowledge and understanding about innovation	Features of the Collaborative Inquiry Model
Flexibility in professional learning environment	Fostering divergent thinking			Fostering construction of ICT knowledge through collaboration and dialogue	
Value internalization	Power and potency of collaborative learning			Plans for changing practice	
Social-emotional climate				Power and potency of collaborative learning	
Fostering construction of ICT knowledge through collaboration and dialogue				Time and support for exploration	
Advancing understanding				Features of the Collaborative Inquiry Model	
Evaluating technology with pedagogical intent					
Power and potency of collaborative learning					

Impacting Features of a Collaborative Inquiry Model on Professional Learning and Thinking

Educational change often requires teachers to challenge and change existing teaching practices (Howard & DeMeester, 2008). “When teachers implement new teaching practices they are taking risks. They leave proven practices and learn to apply new methods, tools, and strategies in the classroom” (Howard, 2007, p. 1). In order for teachers to adopt technology and successfully integrate it into their curriculum, they must have sufficient time and ongoing opportunities to experiment and play with the new tools (Dakich, 2009; Nudell, 2004; Schrum, 1999). Nudell (2004) reinforces this notion by stating, “Building knowledge takes time, and needs to be reinforced with hands-on activities, collaborative exploration of new materials, and the freedom to create activities, make mistakes, revise work, or try something new” (p. 52).

Time and support for exploration. Research suggests that in order for teachers to develop facility with and expand and develop their use of technology, they need ongoing

opportunities to explore, investigate new tools, ask questions of colleagues, and experiment with new ideas and new resources (Nudell, 2004). The collaborative inquiry project afforded participants a safe and supportive learning environment in which they could take risks and experiment with new technologies, applying their learning immediately to their practice. Upon learning *Audacity* in one of the collaborative inquiry workshops, one participant began to utilize the program immediately in her practice, enabling students to record their musical compositions and to self-assess. The teacher felt comfortable trying out this innovation in her practice because she had the group support, confidence and basic understanding of the program to “give it a go.” “I tried *Audacity* spur of the moment, and found it very user-friendly!” (E.H. reflective journal, p. 3). She goes on to explain:

using *Audacity* has been working well, especially with Alana’s support. I still need to play with the program and learn how to edit, cut, etc....I want to spend more time experimenting with *Audacity*...but also want to explore the zoom mic as another alternative. I really want to learn how to use *iMovie*. I need to learn how to use these programs and then can explore on my own (E.H., reflective journal, p. 4-5).

This reflection underscores the importance of peer coaching, collegial support, the need for time to experiment and explore in order to build up confidence for risk-taking.

Another example that further confirms the need for the time and support for exploration can be illustrated in one teacher’s reflection about the use of *Twitter*. *Twitter* - an online micro-blogging tool - offers educators much potential for breaking down the isolating classroom walls, allowing teachers opportunities to collaborate with one another, as well as a quick method for sharing information or resources related to curriculum issues. Teachers can remain abreast of current educational trends, and build their own reliable network of trusted

teachers. *Twitter* also offers teachers access and information to online professional development opportunities in real-time (Wetzel, 2009). Despite the rich potential of *Twitter*, teachers need time and support to explore its value for themselves. “I haven’t given *Twitter* any time...I need to give it time to see the possibilities” (field notes, 9.2). “There’s a lack of time to get into these things” (field notes, 9.2). In one participant’s reflective journal, she echoes this concern: “I haven’t given [*Twitter*] enough time, I know, but I wonder if I ever would? Wading through other people’s communication feels voyeuristic” (S.R., reflective journal, p. 4). These responses underscore the importance of time and support needed to explore the advantages (and dispel the misconceptions) of cutting-edge technologies.

Immediate application to practice. In an interview asking teachers to describe their general perceptions of the value of collaborative inquiry as a form of professional development, one participant compared her learning in the collaborative inquiry model to other forms of professional development, arguing “it’s not even comparable to other workshops where you get a bunch of worksheets, and lots of talking and you come back with stuff. It gets put aside, but [is of] no immediate use. You need to use it right away, and put it into practice for it to work” (L.B., interview, 1.2). This response is aligned with recent research in the field of professional development, arguing the importance of immediate application to practice and authentic feedback (Foltos, n.d.; Joyce & Showers, 1994). The problem with such traditional forms of professional development such as workshops is that teachers often have no opportunity to apply what they learn in these workshops, and no manner in which to receive feedback when they *do* try to apply what they have learned. These findings concur with those of Joyce & Showers (1994) who found that professional learning models which included theory, demonstrations and practice, plus ongoing coaching and collegial follow up offer the

greatest prospect for curricular change. One participant commented on her immediate application of technology through her classroom blog:

I have been using the blog regularly since our last session. I find it to be an excellent documentation tool as well as a great avenue for student reflection....The students have begun commenting on the posts with some teacher guidance. I anticipate that with more teacher guidance and exemplars, student reflections will become more in depth. (L.B., reflective journal, p. 3)

Through her immediate application to practice, this participant was able to recognize the value of the tool, and reflect on ways to improve its function in her practice.

Unfortunately, due to the late timing in the school year, other teachers had little opportunity to apply what they had learned toward long-term, meaningful projects. End of school year commitments such as field trips, early lab closure and school events precluded teachers from applying their learning in a long-term, meaningful manner. However, participants all recognized the importance of feedback from colleagues and from the technology mentor, and valued the feedback they received about their *ideas* for integrating technology into practice.

Peer coaching and mentoring. My work with teachers in the collaborative inquiry model reflects an approach to professional learning that takes theory, demonstrations and practice in combination with peer coaching and support. Research has found that this model offers the greatest prospect for curricular change (Joyce & Showers, 1983; Schrum, 1999). Each week, as participants reconnected at the collaborative inquiry group, they discussed and reflected on ideas, strategies and new technologies that were put into practice, or that they were hoping to put into practice at a later time. In effect, the collaborative inquiry gave teachers the

motivation, confidence and “nudge” to try things out and apply to their practice within a supportive community of learners.

Participants indicated that they felt supported and comfortable in the collaborative inquiry group, and that the group dynamics played a large part in helping to make them feel secure enough to take risks in their learning. As one participant commented in an interview: “I’m learning from others in a non-threatening learning environment. I’m seeing new perspectives from teachers and able to put ideas into practice immediately” (B.E., interview, 2). This same participant later went on to comment about the dynamics of small group interaction: “It was the same group for all sessions – everyone was encouraging. If it were a different group each time, it may have been more intimidating.” (B.E., interview, 2.1)

Teachers felt comfortable asking questions in a group:

[the] comfort level was high due to teachers all being in the same school – we worked together to navigate new sites, asking ‘how did you get there’ and ‘what does this do’, etc. By watching teachers post blogs and ask trouble-shooting questions, it seemed attainable. (B.E., post-study questionnaire, p. 25)

These findings support recent research in the field, which argues that peer coaching and support are instrumental to helping teachers implement and adopt new technology skills and knowledge (Foltos, n.d.; Joyce & Showers, 1994; Schrum, 1999).

Increased confidence and efficacy. The community of the collaborative inquiry group, coupled with access to and support of a constant technology mentor (me), gave participants the confidence and self assurance needed to step outside their “comfort zone” in order to take risks that would ultimately lead to meaningful change. This finding is supported in the literature by Sandra Kay Plair (2008) who suggests,

The existing format for technology-related professional development lacks the continuity that teachers need to develop the confidence and efficacy leading to technology fluency. Teachers crave a constant support person, in close proximity and available to fill in the gaps that arise with the rapid changes associated with technology. (p. 70)

The collaborative inquiry model helped restore participants' confidence in taking new risks, and also opened up new perspectives and potential directions for technology, which ultimately fostered a sense of capacity in teachers. One participant remarked, "I think when you're doing anything collaborative, you're exposed to way more in terms of quantity and quality of available options and ideas...where you see what others are already doing, it gives a leaping off point for what you can do" (D.M., interview, 6.2). Another example of confidence and efficacy is illustrated through a participant's reflection on employing a new instructional strategy, titled *process* observation, which was shared by other members in the group, as a means to actively observe student thinking, and to help students articulate their thinking to others: "[I will try] *process observation* – using the interactive whiteboard...[where] students do the activity while I observe" (L.B., reflective journal, p. 6). Other participants were keen to try blogging with their class, as a form of student and teacher reflection. These strategies were new to teachers, but the culture of support and encouragement within the collaborative inquiry group gave participants the confidence needed to try new strategies in their practice.

These reflections are aligned with a social-constructivist perspective, which argues that as learners participate in a broad range of joint activities and experiences, and internalize the effects of working together, they acquire new strategies and knowledge (Palincsar, 2003; Vygotsky, 1978). Where once participants may have felt intimidated and anxious to even attempt to play with new digital tools and experiment with new instructional techniques; the

collaborative inquiry group offered peer support, encouragement and assistance for one another, allowing participants to feel more comfortable to “have a go.”

Access to technology resources. During collaborative inquiry sessions, each participant brought with them a division-owned notebook (laptop) computer which they had access to at all times – during class time as well as at home. Having immediate access and up-to-date hardware surely impacted on teachers’ confidence and comfort level, as well as a willingness to take risks.

In her study titled *Teachers’ Perceptions about the Barriers and Catalysts for Effective Practices with ICT in Primary Schools*, Eva Dakich (2009) found that teachers who had their own computer and time to practice their skills helped them build competence and confidence in using new technologies. Dakich also found that laptops “helped teachers become more familiar with ICT, and provided them with opportunities to experiment with new technologies in their own time and within their own comfort zone” (p. 448). Access to equipment at home and at school is critical for teachers’ extended practice and for building their comfort levels (Schrum, 1999). Such research findings resonate with one participant in the study, in her reflective journal:

I’m looking forward to trying out new websites with students. [I’m] feeling very confident after practicing at home [with my laptop]. [I’m] noticing ease of using the blog. [I’m] feeling like I need to work on this over summer in preparation for next year. My confidence is rising. [I’m] feeling more free to try new things and websites. (B.E., reflective journal, 4)

Individualized professional development. Participants appreciated having the time to work at their own pace and at their own level, and in accordance with their own individual and

program needs. This approach contrasts significantly to the one-size-fits-all professional development model that pervades current teacher professional development practices. In the collaborative inquiry model, teachers identified their interests and needs, and therefore workshops and mini-lessons could be organized and tailored to suit participants' unique needs and goals (see pre-study questionnaire). One participant articulates this finding very clearly: "I really like that [collaborative inquiry] allows me to choose the direction of my professional growth" (L.B., reflective journal, 1). This response is echoed by another participant, who describes the action research process as "logical, adaptive, self-directed and therefore applicable and meaningful. Teachers *should* be able to identify areas of change" (D.M., reflective journal, 1).

Interestingly, participants also remarked on the significance of the organic, flexible and fluid approach to this professional learning model, in order to help them achieve their goals. "The fluid, dynamic approach rather than a static, rigid one, allows us to make changes and to go in different directions as you need" (D.M., interview, 7.2). Other participants also remarked on the fluidity of the process: "The continuity of the process allows us to refine our goal, and continue to revise our ideas...this is especially helpful for learning new technology...." (S.R., interview 3.4). Two participants agreed to dedicate a period in the timetable to self-directed technology learning in the lab next year. This objective illustrates a desire to set personal learning goals, and to follow through with them with the support of colleagues.

Individual goal-setting was very important for group members – the invitation to identify one's own pedagogical issue, and move forward along one's personal learning continuum, acknowledging growth and development over time was engaging and reassuring at the same

time. “[This form of professional development allowed us to] try, re-evaluate, reassess and try again,” (L.B., interview, 1.2)...“and the fact that we were with a cohesive group, allowed us to “meet, set goals, try them out, talk about them – what worked, what didn’t – learn from colleagues about what worked and try it out again” (L.B., interview, 1.4). The value of the collaborative inquiry approach lies in “the opportunity to create a goal for yourself – it becomes part of your practice, as opposed to a one-off PD session” (L.B., interview, 10.3). These responses parallel current research, which argues that,

with extensive guidance from a master teacher, a group of peers and a detailed professional development curriculum, teachers can pursue largely self-directed goals, working on a lesson plan of their own choosing while knowing support is available to them. Teachers can focus on their own interests and professional pursuits, learning actively, discussing their ideas with colleagues, and reflecting on the types of activities they want to add to their teaching repertoire. (Nudell, 2004, p. 52)

Examples of the individualized nature of the collaborative inquiry model are illustrated in participants’ action research cycles. Participants identified a need for change in their practice, and then decided on a plan of action. This process is described through one teacher-participant’s action research plan as well as her reflective journal: “[My plan is] to learn how to create a class blog with supporting technologies in order to explore Reggio-style documentation and to expand reflection potential for students” (S.R., teacher’s action plan). The participant then goes on to identify the learning, supports and strategies required to fulfill her plan: “Classroom blog to ‘showcase’ student learning (in-process)...Visual art, poetry, creative writing...Use of digital photography, audio recording, video editing” (S.R., reflective journal, p. 9).

Another participant remarked on the value of individualized, flexible learning: “Collaborative inquiry allows you to make changes, and go in different directions as you need” (D.M., interview, 7). These responses illustrate teachers’ desire to take ownership of their professional learning, to decide for themselves how they wish to improve their practice, and take steps forward at their own pace to reach their goals.

Features of the collaborative inquiry model. At the end of the study, participants were asked what types of professional development had the greatest impact on practice. Consistently and across the board, participants described those experiences where *hands-on learning, repetitive practice, in-context modeling and demonstrations, and ongoing projects where teachers were given the time to experiment and collaborate with others* as most meaningful and effective.

I find this approach far more valuable [than other models for professional learning]. The time to try, regroup, reflect and try again allowed me to delve deep into technology and arts-based learning. I’ve achieved a great deal of confidence due to the time afforded to this project. (L.B., post-study questionnaire, p. 24)

This participant also goes on to describe another important feature of the collaborative inquiry model – time for dialogue and collaboration: “I find dialogue and conversations with colleagues to be the most useful in creating meaningful change. Particularly when the conversations are ongoing” (L.B., reflective journal, 2). These features are supported in the literature: “for any PD activity, teachers need time to plan, practice skills, try out new ideas, collaborate and reflect on ideas. Acquiring technology skills and becoming proficient at new ways of teaching in which technology is appropriately integrated requires additional time” (Rodriguez, 2000).

Constructivist learning environment. In her article titled “Time to Experiment,” Nudell (2004) cites three features for creating a productive learning environment for teachers for successful technology integration. She argues from a constructivist perspective, that just like our students, teachers are active learners and learn best when they are given opportunities to engage in hands-on, active learning experiences. A constructivist learning environment is characterized by active engagement, inquiry, problem solving, and collaboration with others (Abdal-Haqq, 1998; Jonassen, 1994). The importance of constructivist learning is supported by participants’ comments in pre-study questionnaires, when asked to describe the types of professional development that had the greatest impact on practice: “hands-on practice is a must!” (B.E., p. 17); “hands-on learning,” (E.H., p 17); “hands-on professional development experiences...repetitive experiences to learn and retain information, and experiences where we left off – a continuum is needed rather than a whole new topic” (D.M., p. 17), and “ongoing practice” (L.B., p. 17). After the study, one participant reflected on the importance of active involvement: we were “not just talked at, but involved in...this is always more meaningful. The *doing* was the important part – having the laptop right there, trying it out, doing it – this was most valuable” (E.H., interview, 4).

Collaborative dialogue and the importance of social learning. Another feature of meaningful professional development, according to Nudell (2004) involves providing opportunities to collaborate with peers. Time for group discussions and reflection helps establish a supportive community of learners in which teachers can learn from one another, as well as from the facilitator. Upon establishing such communities of learners, teachers are more likely to continue to share knowledge and support one another in the future. Participants in the collaborative inquiry group agreed: “I learned so much from others, whether it was helping me

figure something out or introducing me to new technologies, websites, etc.” (E.H., post-study questionnaire, p. 24), “exposure to other peoples’ ideas and projects is inspiring,” (S.R., post-study questionnaire, p. 24);

the opportunity to collaborate and time to meet over the last few weeks has allowed me the time to feel true growth in my professional practice. I’m committed to trying new things based on my personal goals to share with the group each week. (L.B., post-study questionnaire, p. 24)

Another participant echoed the importance of collaboration when she stated in an interview, two heads are better than one. I learn through others very well...[I’m] learning from colleagues. By collaborating with colleagues, it pushes you to do more yourself – I want to help others, just as they’re helping me, so it pushes me to work on my own professional learning. Helping each other is what it should all be about. (E.H., interview, 5)

Sustaining learning over a longer term. The final feature described by Nudell (2004) involves training over an extended period of time. A strong professional development program provides teachers with the time needed for authentic inquiry, reflection and collaboration. Given adequate time, teachers are able to establish a supportive learning environment where they are free to ask questions, build on one another’s knowledge, and learn at their own pace. The collaborative inquiry afforded participants with time to experiment and explore new technologies, over an extended period, which was highly valued by all group members. Several participants indicated in the pre-study questionnaires as well as dialogue sessions that time was the biggest inhibiting factor to integrating new technologies successfully. When asked about the biggest challenge to effective integration of technology, one participant

responded that finding the “time to investigate the possibilities in a meaningful and supportive way” was an obstacle (S.R. pre-study questionnaire, p. 16), while another explained that “time is [the] number one challenge and [the] fear that trying to integrate technology will use too much [time] since I have very limited technology knowledge and confidence” (D.M. pre-study questionnaire p 16). Reflecting on a recent workshop to learn *GarageBand*, another participant expressed her disappointment with the traditional training approach, responding, “I didn’t learn a thing! Others got to use it, but I didn’t get enough time to try” (p. 1 field notes 2.4). Another participant echoed the same concern: “we need time to talk about technology issues and questions...” (field notes, p. 1, 4.4). This finding is echoed in the literature by Mehlinger (1997), who estimated that teachers need more than 30 hours of training and hands-on experience to successfully adopt new technology into practice.

For several teachers involved in the collaborative inquiry project, this was the first opportunity where they were able to spend a significant amount of time exploring the different uses of technology, and more importantly, drawing up action plans which addressed their unique needs and goals, integrating their newly acquired technology skills. “The time to try, regroup, reflect and try again allowed me to delve deep into technology and arts-based learning. I’ve achieved a great deal of confidence due to the time afforded to this project” (L.B., post-study questionnaire, p. 24). Another participant remarked: “time over successive sessions builds knowledge and confidence” (S.R., post-study questionnaire, p. 24), while another commented on the dynamics of the intimate group: “[I] loved [the] small group interaction and time to explore” (B.E. post 24).

These sentiments reappeared in participant interviews later on in the study: “having the time to explore some of the websites and tools was invaluable, [as well as the] time to see

what's out there before deciding what to pursue" (B.E., interview, 10.3). The desire for more time is echoed by one participant, in her reflective journal: "teachers are somewhat isolated in their classrooms and finding time to collaborate with colleagues is to often put by the wayside" (L.B., reflective journal, 2). Such reflective statements emphasize the value that teachers place on having the time – outside of class, with others and alone – to explore, experiment and build confidence with new digital tools.

Learning to evaluate technology with pedagogical intent. Although risk-taking and experimentation are desirable, if not critical practices for the successful integration of new technology; meaningful and authentic technology infusion also requires thoughtful critique and analytical thinking. Not only is the appropriateness and suitability of the technology important to consider, but one must think carefully about the intent or purpose of the learning, and whether the new technology supports the learning intent in a meaningful fashion. "Being prepared to use technology and knowing how that technology can support student learning have become integral skills in every teacher's professional repertoire" (UNESCO, 2008). Throughout the study, participants questioned new technologies thoughtfully, and analyzed their value to support student learning. As evidenced in teachers' lesson plans, assessment for learning criteria (Clarke, Owens, & Sutton, 2006; Davies, 2001) were used to ensure that technology helped progress student learning. Participants were careful to identify the lesson's purpose or intent, outlined the enabling tasks, indicating where and how technology would be used to support the lesson outcomes, and determined learning criteria that would enable students and teacher to decide if the objectives of the lesson were learned (Davies, 2001; Sutton, 1995).

In one collaborative inquiry session, I challenged the group to look critically at several interactive websites. Constructive discussions about purpose and intent emerged from all group members. One participant commented in a post-study interview, that such discussions were of most value to her: “[We need to] ensure that the technology is moving children’s learning forward.” “[It is important to] critically look at the technology and know your intent” (K.A, interview, 8). She goes on to describe these discussions as most helpful: “is [the technology] being used purposefully or just keeping students busy? Looking at these ideas critically, as a group was most valuable” (L.B., interview, 6). As collaborative inquiry sessions extended over time, participants had the opportunity to delve deep into new technologies, critically evaluating whether they might truly support student learning, and reinforce the purpose of the lesson.

Fostering reflective practice. Professional reflective practice is a “complex and intellectually challenging activity” (Moran & Dallart, 1995, p.22). It is an ongoing process of examining and refining process that takes time and a sustained commitment (Cole & Knowles, 2000). Ideally, reflective practice leads to new action or verification of one’s existing actions.

Action research requires participants to reflect on their actions continually in order to improve (McNiff & Whitehead, 2006; Stringer, 2004). Throughout the collaborative inquiry, two forms of reflective practice emerged: reflection-in-action (thinking on one’s feet) and reflection-on-action (stepping back from one’s practice to ponder and evaluate one’s actions) (Schön, 1983). These forms of reflective thinking were made evident throughout participants’ reflective journals, group discussions and interviews. Reflection-in-action was illustrated by one teacher who described having to “think on her feet”, as her lesson did not go at all as planned, but instead of “going down with the sinking ship”, she decided to take a divergent

path, and applied the new digital tools she had learned: “It was nothing close to the lesson plan, but I took a divergent path and demonstrated flexibility. The kids and I had a blast” (E.H., field notes, 16.2). Another example of reflection-in-action was a spur of the moment decision to have students’ compositions digitally recorded so that they could self-assess their performance. “I tried out *Audacity*...it was a teachable moment” (E.H. field notes 8.3).

The extended timeframe for the collaborative inquiry afforded participants with *time* to think carefully about their own practice, enabling reflection-on-action. “[Action research] causes you to reflect on what you’re doing, carefully consider the direction you’re going to take – for both the children’s learning and your own professional learning” (D.M., interview, 7.2). Another participant remarked in an interview, “[collaborative inquiry provided an] opportunity to create a goal for yourself which becomes part of your practice, as opposed to a one-off PD session” (S.R., interview, 10.8).

Reflection-on-action was illustrated through the continuous goal-setting that manifested throughout the collaborative inquiry process – as evidenced in group dialogue sessions, action plans, reflective journals, and in-class observations. One example describes the art and music teachers deciding that in order to advance their own learning and achieve the goals they had set out for themselves, they would like to reserve a slot in the technology timetable for the following year. Another example of reflection-on-action was the work of one participant whose goal was to use a blog as a vehicle for her own and her students’ reflection. Due to the early lab closure, she was unable to arrive at the final stage of this project. However, she writes about her experiences and engages in reflection on her attempts:

Access to the lab has thrown a bit of a wrench into room 2’s Superhero project. Alana and I worked with Savannah (took a photo, copied it into Paint, manipulated it – wings,

mask, etc. – but I think we’ve run out of time. My big goal is to become familiar with setting up and managing a blog. I have material from another investigation (rockets) which I can use as the vehicle for my ‘blog’ learning. I think it might be met with some resistance, but wouldn’t it be great if class blogs were the vehicle for sharing within our school? At staff meetings...this would promote Reggio-style documentation, reflection...At first, the technology support teacher could help teachers with the mechanics of it...(?) Regardless, I’m excited about it for next year. In addition, my current technology goals are: 1) to improve in the area of digital photography, 2) video/video editing. (S.R., reflective journal, 6-7)

The insights that participants gleaned from their own reflections and their analysis of their own and others’ practice were fed back into practice. A forum was established for sharing individual experiences in which colleagues could respond, challenge and support one another. This forum fostered a collegial, collaborative climate that supported participants’ professional development (Riding, Fowell & Levy, 1995), where critical reflection flourished.

The collaborative inquiry project impacted teacher learning and thinking about the use of ICT in arts education in at least three ways: it gave teachers the confidence to experiment and take risks; a medium to engage in thoughtful and careful critique about new technology in order to support student learning, as well as a forum to think reflectively about their practice. I will now discuss ways in which participants’ practice changed and evolved throughout the inquiry.

Impact of a Collaborative Inquiry Model on Changed Practice

Fullan and Pomfret (1977) present a model for measuring change in curriculum and instructional practices. The researchers identified five dimensions of change vis-à-vis the

implementation of an educational innovation: (a) subject matter or materials, (b) organizational structure, (c) roles and behaviours, (d) knowledge and understanding, and (e) value internalization. I used Fullan & Pomfret's model as a lens to analyze the qualitative data, and to evaluate teacher change. These five dimensions will now be discussed within the context of this study.

Changes in subject matter and materials. Fullan and Pomfret (1977) define subject matter as the content of the curriculum "that the teacher is expected to transmit to the student or that students are expected to acquire on their own or in cooperation with their peers" (p. 361). "Materials are characterized by written materials, the spoken word, audio and visual tapes, and demonstrations." (p. 362). A contemporary perspective on the researchers' model would also likely include new technologies and computer peripherals such as cameras, SMART Boards, video equipment, or digital sound recorders. Assessment procedures, the researchers maintain, are also included under the subject matter category.

There are several examples of changes in subject matter and materials in the study. In analyzing teachers' lesson plans, all participants indicated that they would be employing at least *one* new technology or digital tool to support lesson outcomes. *Audacity*, *MovieMaker*, virtual art galleries and other websites, class blogs, *PhotoStory 3*, SMART Boards, cameras and digital microphones were resources and tools that were described to support the learning objectives in teacher lesson plans.

In the pre-study questionnaire, inquiry group participants were asked to describe ways they have used technology to support and enhance their own teaching, as well as student learning in, through and about the arts. Three participants described using the internet to find videos or images to deepen student understanding or to enhance their own teaching in the arts.

One teacher described an example of using a *YouTube* video, titled “Storm at Drake Passage” to extend students’ inquiry on ships, explaining that she afforded “students a virtual experience which might then allow for richer creative expression” (S.R., pre-study questionnaire, p. 16). Another teacher-participant described her use of digital portfolios with students as a form of assessment. Yet another example shared involved a student-led, arts-integrated inquiry, where technology was used to plan and question, gather and make sense of information, communicate and share understanding with others. Such rich examples illustrate that some teachers were already using technology creatively and resourcefully in their practice. These teachers helped spark the collaborative inquiry group’s creative thinking, prompting other teachers to ask questions such as, “how did that work?” “how did you...”, setting the stage for group ideation and synergy.

Other participants in the group offered more basic examples of technology applications. Such examples appeared more like “digital worksheets,” where student use was limited to simple “fill-in-the-blank” activities, or were used in place of an overhead projector. These examples of more rudimentary technology applications illustrate teachers’ basic knowledge, and minimal confidence to take risks in their teaching with technology. Upon the conclusion of our collaborative inquiry, teachers’ descriptions of new applications of technology were much more authentic, meaningful and interesting.

Most participants experimented with at least *one* new digital tool or program and applied it to their practice. For example, one participant learned how to use *Audacity*, a free digital sound recording and editing program, and then implemented it into her practice, using it daily with her students as a reflective tool – so that students could hear themselves playing their instruments, and offer suggestions for their own improvement.

Many teachers had experimented with classroom blogs as a form of documentation, influenced by the Reggio Emilia approach, posting student work, inviting reflection from their own students and the world:

I've learned how to post to our school blog and have created several new posts about projects in class. I've begun to use the blog to document student reflections through comments. I've also begun to use the blog as a teaching tool by posting specific inquiry questions for students. (L.B., post-study questionnaire, p. 23)

The blogs were used as a new teaching tool to introduce new subject matter, as a fresh, new reflection tool for students, as well as for documentation of student growth for assessment purposes.

Four teacher participants described changes they would make to their practice in the following year. One teacher set three goals for herself for the following year: “to plan and question, and gather information as a class on topics of interest, using Google and online art galleries and art gallery virtual tours; to further expand arts projects [occurring in the classroom], and to support student learning and understanding through digital photography – city ABC’s, city numbers, etc.” (B.E., post-study questionnaire, p. 23). One teacher felt that her practice with technology would shift to more of a collaborative, project-based approach, and another teacher looked forward to making her teaching more interactive through the use of a SMART Board. Other teachers envisioned changes with technology in the next school year, feeling enthusiastic to experiment and try new approaches: “Next year, I want to try these new technologies – use online galleries, create online school galleries. I look forward to having my

SMART Board installed, to exploring new sites [and] taking risks” (D.M., reflective journal, p. 5).

Not all participants revealed changes in subject matter or materials. Two participants chose to experiment and play with new digital tools during collaborative inquiry sessions, however, did not implement any of these new practices into their program. One participant felt overwhelmed and unable to take the leap to her own practice, maintaining that she was “terrified that it [technology] won’t work” (D.M., field notes 4.1). However, in her post-study questionnaire, she did indicate two new ways she used technology to enhance her own teaching in the arts: “I used an online gallery to gather artist visuals, and I used a website to alter, enhance and explore images” (D.M., post-study questionnaire, p. 23). Although this teacher perceived her application of technology to be inconsequential, these two examples of new technology use illustrate a willingness to take risks, and again “have a go.”

Another participant simply did not have the time to implement new ideas into her practice, due to end-of-year conflicts which left her very little time to work with her own students. Due to the timing of the collaborative inquiry, as well as the unanticipated closing of the computer lab, meaningful, long-term projects were not achieved. However, all teachers indicated their excitement and anticipation for the next school year, as ideas were sparked and seeds planted.

Changes in organizational structure. Fullan and Pomfret (1977) argue that structural changes include modifications in “formal arrangements and physical conditions – different ways of grouping students, alternative spatial or temporal arrangements, the presence of personnel to perform new roles, and an adequate supply of new materials” (p. 362). One example of such a change involved the music teacher participant taking her students to the

technology lab to explore the *Arts Alive* website – an interactive website dedicated to teaching and learning about the performing arts. Never before had this teacher explored an alternative spatial arrangement for the music class.

Teacher-participants expressed their desire to continue the collaborative inquiry group for the following school year. In one of our dialogue sessions, a discussion unfolded about participants' desire to do more of the collegial sharing at monthly staff meetings. In essence, this suggests a change in the organization of staff meetings to enable dialogue. Sharing our successes, the group felt, was motivating and fostered collaboration. The collaborative inquiry group felt that they could be the leaders to steer the school direction for the following school year for such a sharing forum.

In the same vein, another example of change in organizational structure became apparent when group members proposed a solution to reorganize the school timetable for the following year, suggesting that it should be students' *projects* and *classroom needs* that determine technology lab time, rather than the technology slots being simply distributed equally to all classrooms. These two examples are particularly significant as they are aligned with current research and trends in action research, which recognizes and honours teachers as agents of change. Given the comments made by teachers in interviews, reflective journals, dialogue sessions as well as a general sentiment of group solidarity, teachers began to see themselves as powerful and capable of effecting positive change in the organizational structures of the school.

A final example of a change in organizational structure was that of a teacher using class time to work on a technology-integrated project on *heroes*. This particular teacher-participant generally explored technology with the support of the technology mentor, in the technology

lab. However, due to the unforeseen circumstance of having the lab shut down, she decided to work with the student in her own classroom – with my help in the background, using the technology resources she had available to her. She and the student worked collaboratively capturing photographs, and digitally editing them to tell a story about heroes. This teacher may not have attempted something like this on her own prior to the collaborative inquiry study, but felt confident in her ability to take the risk and experiment autonomously.

Changes in roles and behaviours. Changes in roles and behaviours are characterized by Fullan and Pomfret (1977) as new teaching styles, new functions to support these styles, new role relationships between teachers and students, teachers and administrators and teachers and consultants. Throughout the collaborative inquiry project, teachers shared their knowledge about specific programs and tools with one another. Teacher participants became “experts” of certain programs and digital tools, and others learned very quickly who to go ask when they had an issue or question about a specific program. Teachers in the group assumed roles of peer mentors and coaches, modeling their technology use openly for other participants to learn from. One example of peer mentoring was when one teacher-participant, who was a very quick learner, was able to demonstrate blogging with others in the group, and the entire process she went through to create her class blog. Others in the group were very intrigued, and began experimenting with the process themselves. Collegial sharing within the group also exposed the talents, interests and expertise of group members, leading participants to discover group “experts” in domains such as photography, design and video-editing.

Another example of change in roles and relationships was that of teacher and student. My observations of teachers in the lab and in classrooms were that by the end of the collaborative inquiry project, many teachers felt more comfortable allowing their students to

“take the lead” and teach them about the technology. Many teachers observed that their students had a wealth of knowledge about technology, but were initially reluctant to hand over control to the student. Once teachers felt more comfortable to take risks with their learning, they began to engage and seek the assistance of student-experts. For example, during one of the technology classes I had an opportunity to observe, the teacher had difficulties with a program, and simply asked her students if anyone knew what to do next. She elicited the help of an eager student, who quickly helped with the troubleshooting. Such an occurrence became more common, as teachers began asking their technologically-savvy student-helpers to engage in a sort of peer-teaching, helping not only fellow classmates but also their teachers. This finding supports Black’s (2006) research, who argues that students are being asked to take a much more active role in schools. According to Black, students are taking positions of power: they operate equipment, run labs, conduct workshops, teach their peers, collaborate, and in some cases teach their teachers in formal situations. They are taking on a variety of roles ranging from assistant and technician to workshop leader and educator... These students end up taking more leadership roles in their classrooms and in the school community. (p. 23)

Knowledge and understanding. The fourth dimension of change relates to the knowledge and understanding that participants have about the innovation’s various elements, such as “its philosophy, values, assumptions, objectives, subject matter, implementation strategy, and other organizational components” (Fullan & Pomfret, 1977, p. 364).

Throughout the study, participants commented on their excitement about learning new digital tools, and how they would apply them to their practice. During dialogue sessions, in reflective journals and in post-study questionnaires, participants shared their knowledge and

ideas with one another, contributing to the knowledge and understanding of their colleagues: “I learned to post to the blog, to use social networking sites to connect with other professionals, to reflect with students on their experiences in the classroom.” When asked to reflect on how she contributed to the learning of others in the group, she responded: “once I learned to use the blog, I was able to help others with their posts” (L.B., post study questionnaire, 25).

Not all teachers perceived that they contributed to other group members’ learning: “I felt like I was one of the lower level technology-aware teachers. I learned a lot by listening and doing” (B.E., post-study questionnaire, p. 25). Another participant echoed this perception: “the others teach a different program than I do and are more knowledgeable than I am” (E.H., post-study questionnaire, p. 25). One participant revealed her frustration about not being able to contribute to group learning: “I find I’m struggling to manipulate simple computer procedures so while I’m impressed with what [others] can do, I can’t! I have no samples, I cannot do basic things, I cannot manipulate sites. [Others] are way beyond my skill set” (D.M., post-study questionnaire, p. 25).

Although these participants’ perceptions revealed a limited contribution toward others’ learning, they did acknowledge a deeper *individual* understanding of the new technologies, as well as more sophisticated knowledge about how these new technologies could best serve theirs and their students’ needs. In their reflective journals, teachers shared how their understanding of certain technologies grew deeper, becoming aware of their uses, applications and implications. As one participant commented,

[I am] excited about the blog, although [I] recognize that a blog’s true value is not just as a vehicle for displaying student learning. It’s an interactive medium. As a reflective tool

with young children, perhaps viewing the blog and having a reflective discussion would be of use. (S.R., reflective journal, p. 3)

Another teacher reflected on her learning about using a blog with her class:

I have been using the blog regularly since our last session. I find it to be an excellent documentation tool as well as a great avenue for student reflection. I have written four posts for my classroom thus far. The students have begun commenting on the posts with some teacher guidance. I anticipate that with more teacher guidance and exemplars, student reflections will become more in depth. (L.B. reflective journal, p. 3)

Later in her reflective journal, the teacher engages in critical self-reflection, noting that “next year, I will be more clear about the task, intent and criteria on the blog.” She also commented that she “found it very useful to be reading [students’] posts while they were working in the lab, giving them immediate feedback and either approving their comment or not.” These comments illustrate the teacher’s own personal learning, consolidating her knowledge about how best to use the technology to support student learning.

Value internalization. The final dimension of teacher change involves teachers’ valuing and commitment toward implementing the various elements of the innovation. Throughout the study, there was evidence of teachers’ perseverance and commitment to using new technologies thoughtfully and meaningfully in their arts education practice. Time and time again, teachers commented that when something did not go according to plan, they simply carried on, taking divergent paths, and ended up learning something new in the process. When technological glitches got in the way of a successful lesson, many teachers called for support from colleagues, or attempted to “fix” the problem themselves, or with the help of a capable student. Prior to the collaborative inquiry project, it is unlikely that these teachers would have

even attempted using these new technologies without one-on-one support from the technology mentor.

Many participants shared their interest in carrying on with the same approach to professional learning the following year. The mark of a successful project, commented one teacher, is “if we are willing to put our own time into it, this means it has merit” (S.R., interview, 3.3).

Most participants applied their learning from the collaborative inquiry group in at least *one* aspect. Most teachers committed to exploring the new technology, and then trying it out in their practice. The commitment to learn was evidenced by the group synergy, brought about by sharing and dialoguing about the possibilities of many new technologies. A contagious excitement was shared amongst all participants who couldn’t wait to test these ideas out in their own practice. At one collaborative inquiry session, participants began to spontaneously share their ideas and experiences with one another. Their pride of accomplishment, interest in what others were doing and support for one another was tangible. Questions and comments emerged, such as “how did your kids do that?” “what a great idea!” and “I’m going to try this next time” were indicative of participants’ interest and keenness to experiment with new ideas. It was through participants’ successful attempts to integrate technology into their arts education programming that led to changes in their values and philosophical stances about technology infusion. Once participants took risks and felt comfortable in doing so, they began to feel and see success in their teaching practice, which led to transformations on two levels: an individual value shift – recognizing and realizing the advantages and creative possibilities of new technology for their own program; as well as a group value shift, where group members

saw the successes that others were having, and demonstrated an inclination to trying out such ideas in their own practice.

Enthusiasm and excitement amongst participants was observed during many collaborative inquiry dialogue sessions. In particular, during one presentation of the latest Web 2.0 tools, where I demonstrated tools such as *Wordle*, *Flickr*, *Twitter* and *VoiceThread*, all participants eagerly began pitching in with ideas and possibilities. There was much sharing, excitement and synergy that was palpable through participants' eager facial expressions and non-stop dialogue.

Other facets of changed practice. While Fullan and Pomfret's (1977) model offers a straightforward theoretical structure for measuring curricular change, I have also discovered examples of teacher change that went beyond the criteria of this model, offering new insights of changed practice. These examples will be helpful in identifying possible areas for future research and inquiry.

Changes in collegial relationships: Professional learning communities foster teacher learning. The development of a strong professional learning community was a critical factor in changing the practice of teachers. Participants felt comfortable sharing in the small-group context, yet compelled to push each other to a higher level – looking critically at their own teaching practice and their own ICT knowledge, working together to improve their practice. One participant confirms this notion:

by collaborating with colleagues, it pushes you to do more yourself. I want to help others, just as they're helping me, so it pushes me to work on my own professional learning. It's about stepping it up a notch...we were all on the same page, and everyone has kids' interests at heart. (E.H., interview, p. 5)

An anecdotal example that strengthens the idea of teachers pushing colleagues to higher-level thinking occurred when we were exploring new digital tools, and sharing how they might be used to support our practice. Participants began challenging each other with questions and observations that raised each others' thinking to a higher level. One participant commented that we need to use the technology to extend learning – that it should not be the focal point of our instruction, but rather, the curriculum or learning outcome should drive the learning, and the technology be used to support, enhance and extend that process (field notes, 6.2). As the participants discussed the implications of new digital tools, they were helping one another to look critically at these tools, and in essence, helping to hone and refine each others' practice.

Amplifying teacher voice: Teachers taking ownership of their professional development. Another way the collaborative inquiry model changed instructional practice was by giving teachers a voice. Teachers were empowered by choosing the direction for their own professional learning, which in turn, helped them to feel confident in making changes at a broader level. Time and time again, teachers discussed the value of the collaborative inquiry model for professional learning, and the advantages of action research as a means to transform practice. They echoed a common disappointment with the current nature of professional development, arguing that a top-down approach rarely achieves long-term, meaningful change. Participants concurred that change is indeed needed in the current structure and format of professional development, and felt that the collaborative inquiry model offered the greatest potential for transforming teacher practice.

Teachers were involved in all stages of their professional development, from its planning and development, to its implementation, assessment, and ongoing revision. Teachers in this project were given a unique opportunity to make individual decisions about their own

professional development, identifying their own needs – not being directed by others as to what they *should* be learning. Involving teachers as active participants in the planning and implementation of their own professional development enabled teachers to identify themselves as agents of change in their own practice.

Employing Fullan and Pomfret's (1977) model for measuring pedagogical transformation given the five criteria for evaluating teacher change: (a) subject matter or materials, (b) organizational structure, (c) roles and behaviours, (d) knowledge and understanding, and (e) value internalization), I argue that transformation was indeed evidenced in teachers' curriculum and instructional practices, in their endeavours to integrate technology into their arts education programming. I will now discuss the impact of collaboration on participants' knowledge construction within the study.

Fostering the Construction of ICT Knowledge through Collaboration and Dialogue

Social construction of knowledge. The collaborative inquiry model provided an avenue for the construction of knowledge. In order to examine *how* the model helped foster the construction of knowledge, it is important to consider how new knowledge is created in the first place. Arguing from a social-constructivist perspective, the main sources of knowledge are constructed by the collaborative efforts of groups of learners. In this framework, knowledge is constructed through one's interaction with the world as a social construct. In fact, Vygotsky (1978) believed that all higher level cognitive processes develop out of social interaction. Knowledge does not exist *outside* the individual, waiting to be transmitted, but rather through one's interaction and collaboration with others and with the world. The most meaningful learning occurs best when learners have a chance to communicate their thoughts in a dialogic process where we create and negotiate meaning with one another. When multiple

voices, perspectives or discourses are present, where individuals engage and interact with one another to create a shared understanding, intersubjectivity occurs. This intersubjectivity – differing points of view coming together to negotiate meaning – is the rationale behind collaboration.

The concept of collaboration is central to the co-construction of knowledge. Wikipedia defines collaboration as “a recursive process where two or more people or organizations work together in an intersection of common goals — for example, an intellectual endeavour, that is creative in nature—by sharing knowledge, learning and building consensus” (Wikipedia, <http://en.wikipedia.org/wiki/Collaboration>, n.p). How did collaboration take place throughout this inquiry? To answer this question, I will examine the strategies and experiences of the collaborative inquiry group, and how they engaged in the process of knowledge construction.

Importance of scaffolding. Vygotsky’s social-constructivist theory gave rise to the development of scaffolding theory, where learners take on new knowledge from an expert. Scaffolding is achieved through a gradual release of assistance and support, until the expert feels that the learner has now become an expert, in effect, making the new knowledge their own. In the collaborative inquiry model, scaffolding theory was employed so that teacher/learner-participants could construct their own ICT knowledge, effectively transforming this knowledge into the *application* of knowledge to practice. Teachers were offered explanations and demonstrations of new digital tools, and invited to participate in the process of exploring these tools. As the ICT expert-facilitator, I helped verify and clarify their understanding about technology. There was also a great deal of modeling and demonstrating, so that participants would feel comfortable in trying these tools in a group, and then later, on their own. I also encouraged participation from teachers to offer support to one another –

taking on the role of “expert” and sharing their new knowledge and skills with others in the group. I offered both challenge and support, so that learner-participants always felt learning was in their reach, and they could achieve success.

Scaffolded instruction in the collaborative inquiry model emerged through eight stages:

- a) pre-engagement of the teacher-learner, where I shared a “mash-up” video of world-class exemplars of arts and technology infusion, piquing participants’ interest;
- b) establishing a goal, where teachers discussed an area of their practice they would like to improve and setting a realistic goal for themselves;
- c) diagnosing the needs and understanding of teacher-learner, where I surveyed teachers through a pre-study questionnaire to invite input, and collected anecdotal evidence of needs during collaborative inquiry sessions based on questions and general impressions;
- c) providing individualized assistance, where I worked individually with teacher-participants both in the collaborative inquiry group, as well as in their classrooms (participants also paired up with one another as expert-apprentice pairings to receive individualized support);
- d) maintaining pursuit of the goal, each week we met to review our action plans, discussed the challenges and successes of our actions, and engaged in collective problem-solving;
- e) offering feedback, where the group and I provided immediate descriptive feedback, specific to what was working, pointing out next steps for learning;
- f) control for frustration and risk, creating an environment where teachers felt free to take risks and consider alternative ways of thinking;
- g) supporting the internalization of new idea toward independence, where participants internalized new strategies and became less dependent on me for support; and finally,
- h) generalization to other contexts, where opportunities were afforded for participants to practice new strategies in a variety of contexts.

Scaffolding strategies used in the collaborative inquiry project included: joint problem-solving, creating a climate of warmth

and responsiveness, questioning, and cooperative learning (Hogan & Pressley, 1997, Larkin, 2002).

A professional learning community is born. A key impetus for the social construction of knowledge in our collaborative inquiry group was the establishment and nourishment of a professional learning community. Reichstetter (2006) defines a professional learning community as a group “made up of team members who regularly collaborate toward continued improvement in meeting learner needs through a shared curricular-focused vision” (p. 1).

In a culture of inquiry, the teachers in this group engaged in authentic interactions including openly sharing failures and mistakes, demonstrated respect and constructively analyzed and critiqued practices and procedures (Marzano, 2003) – actions which characterize a professional learning community. “I learned so much from others, whether it was helping me figure something out or introducing me to new technologies” (E.H. post-study questionnaire, p. 24). “We all learn through the ideas, challenges, successes of each other” (S.R., interview, 10.1). “Collaborative inquiry becomes part of your practice. Support of other people’s ideas and knowledge and critiques is useful” (L.B., interview, 10.5).

As a collaborative inquiry group using the action research model, participants identified a problem or area of concern in their own practice, considered and selected courses of action, and reflected on and evaluated their actions. “We meet, set goals, try, talk about it, what worked, see and learn from colleagues what worked, then try it out again.” (L.B., interview, 1.5). Teachers appreciated the continuity of the approach, working with the same group of people to refine goals, put ideas into action, and reassess one’s practice within a supportive community of learners. “Collaborative inquiry assumes continuity of process, which allows people to be exposed to new ideas, try them out, develop an idea and then share with the

group” (S.R., interview, 10). Participants deepened their own individual understanding, but also contributed to the collective understanding and problem solving of the group. The sense that “two heads are better than one” was echoed by teacher participants: “I learn through others very well. By collaborating with colleagues, it pushes you to do more yourself – I want to help others, just as they’re helping me so it pushes me to work on my own professional development. It’s about stepping it up a notch” (E.H., interview, 5.2).

Such a response is aligned with social constructivist theory, which defines learning as an active, social process (Vygotsky, 1978). Social constructivist scholars argue that sharing individual perspectives results in learners constructing a deeper understanding together that would not have been possible alone (Greeno, Collins & Resnick, 1996). Teachers commented throughout the collaborative inquiry that they appreciated having an encouraging group with which to share ideas and problem solve. One participant describes the importance of solving problems by “talking through potential obstacles with colleagues” (L.B.), and that others are always able to share a new perspective. As participants collaborated with one another, they developed their own capacity, building from and feeding off one another.

Zone of proximal development. These findings also support Vygotsky’s (1978) theory of the Zone of Proximal Development, which is defined as “...the distance between the actual developmental level as determined through independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (p. 78). Peer collaboration enabled teacher-participants – who arrived with varying levels and knowledge and experience – to learn from a more “capable other.” Knowledge was co-constructed through team sense-making (Chan & Pang, 2006). This finding is also supported in the recent research of Eva Dakich (2008), who

describes the importance of collaboration in the professional learning community for teachers learning technology:

The school leadership facilitates teacher collaboration in order to promote successful integration of ICT in learning and teaching. They offer teachers opportunities to share ideas and learn from each other in the more intimate and comfortable environment of smaller groups referred to as Professional Learning Teams. Working in smaller teams within the school environment reduces some of the pressure and counter-balances anxiety and information overload. It encourages teachers to learn at their own pace and reach beyond their comfort zone without experiencing significant levels of frustration.”

(Dakich, p. 449)

When teachers engaged with a more capable “other,” they were able to refine their thinking and performance to make it more effective. In essence, the collaborative inquiry model helped to “stretch” teacher/learner-participants to a higher level, without having to experience major frustration.

Social-emotional climate. In the post-study questionnaire, one participant explained that because all teacher-participants came from the same school and knew each other well, the comfort level was high, and felt at ease to ask questions of one another, without the fear of being embarrassed. “I loved the informal approach – six or less colleagues team collaboratively to approach new subject material...[is] less intimidating” (B.E., interview, p. 9). Teacher-participants were able to ask troubleshooting questions of one another, and solve problems collaboratively. Participants described learning how to blog, how to use social networking sites to connect with other professionals, using voice/sound editing/recording software, as well as exposure to a variety of useful websites as being most valuable.

While most participants described at least one way they learned from others, one participant felt that her learning, as well as her contribution to others' learning, would have been developed further with *more time* to extend ideas and share them with group members: "perhaps if we had more time to develop ideas and share, there would have been more learning between members in the group" (S.R., post-study questionnaire, p. 25). Although most teacher participants described at least one way in which they learned from others, interestingly only one teacher participant felt that she contributed to the learning of others. "Once I learned to use the blog I was able to help others with their posts" (L.B., post-study questionnaire, p. 25). Other participants felt that their personal knowledge of technology was extremely limited, and therefore perceived that they "took" more than they "gave." "[I] felt like I was one of the lower level technology-aware teachers. [I] learned a lot by listening and doing" (B.E., post-study questionnaire, p. 25). "The others teach a different program than I do and are more knowledgeable than I am" (E.H., post-study questionnaire, p. 25).

The small-group, interactive, intimate context of our collaborative inquiry cohort was a critical factor toward fostering a professional learning community. One participant commented that she "loved the informal approach – six or less colleagues team collaboratively to approach new subject material is much less intimidating" (B.E., interview, 9.1). These feelings resonated amongst group members:

[as a] "small group, we are able to collaborate and dialogue vs. sitting in rows, listening to a speaker. [It is a] non-threatening environment, with the same group for all sessions – everyone was encouraging. If it were a different group, the experience may have been more intimidating (B.E., interview, 2.5).

These findings are aligned with those of Demetriadis et al.'s (2003) and Dakich's (2009) observations, that teachers learn better in the real setting of their own workplace when they are not isolated culturally and structurally. In such professional learning communities, teachers are more likely to engage in ongoing learning related to the integration of ICT, "which helps them develop their agency to facilitate pedagogical shifts" (Dakich, p. 451).

Power and potency of collaborative learning. Prior to the collaborative inquiry in a pre-study questionnaire, participants were asked to describe their most influential professional development experiences. Many participants cited hands-on learning experiences as having the greatest impact on professional practice. Classroom visits and observations, observing and learning from mentors, repetitive experiences and practice, and ongoing, cyclical professional development projects with opportunities to plan, share and reflect with other group members were mentioned as some of the most meaningful type of professional development.

Responses from group members in the post-study questionnaires were diverse, but very positive. Participants described the benefits of the collaborative inquiry: (a) learning from others, (b) an opportunity to collaborate with one another, and (c) a sense of goal setting and accountability to share experiences and ideas with the group. Several teachers discussed the cyclical nature of the project as having the most impact; time to apply new ideas, regroup, and try again allowed one participant to "delve deep into technology and arts-based learning" (K.A, post-study questionnaire, p. 24). The plan/act/observe/reflect model supported the slow and deep nature of participants' professional learning, emphasizing that such learning can be "fluid, changing, adapting rather than static" (W.L, post-study questionnaire, p. 24).

Other participants attributed the benefit of *time* to building knowledge and confidence. All participants described the collaborative inquiry approach as being more valuable than

traditional professional development models. I revisit a participant's commentary expressing her desire to continue this approach next year as a grade-group cohort: "Time over successive sessions builds knowledge and confidence. I would like to continue as a lower floor team" (S.R., post-study questionnaire, p. 24). "I would like to carry on the same approach next year. It was a successful project...if we are willing to put our own time into it, this means it has merit" (S.R., interview, p. 3.3).

In one collaborative inquiry dialogue session, participants began to discuss the success of the project, and the impact of collaborative learning. Several participants were so moved by the impact of our group sharing, they suggested that staff meetings evolve into a forum for sharing, collaboration and celebration. One participant remarked on the importance of collegial sharing: "Sharing even the tiniest successes is motivating. It fosters collaboration amongst staff members" (S.R., field notes, 10.3).

Many participants felt that the collaboration was the most valuable part of the professional learning. "I liked getting ideas from others – this sparked new ideas, more divergent thinking. I came up with ideas I might not have come up with on my own." (L.B., interview, 9.8). Dialogue exposed participants to new ideas, and new ways to apply technology. "In some ways, the process of idea sharing helped participants refine their own ideas. For example, a mini-lesson on the free, collaborative digital tool *VoiceThread* led to a discussion about its many applications in the classroom. Teachers began sharing ideas and possibilities, then individually refining those ideas based on their own unique contexts and student needs (field notes, p. 12.2).

Although several teachers found idea sharing to be valuable, one teacher had difficulty making connections to her own practice (music). She felt that she needed to stress

performance in her program, and therefore would not have time to invest in exploring and experimenting with these new ideas with her students. An example of collective problem-solving emerged at this juncture, as another teacher offered the suggestion of making connections to musical compositions online, or having students play a piece, listen to it, and reflect on it using some of the digital tools we had been exploring.

Knowledge construction: Importance of dialogue and collaboration. Dialogue and collaboration played an important role in the teachers' construction of knowledge related to teacher-participants' professional practice. Several participants shared that simply being introduced to new ideas and new ways of thinking helped foster new knowledge. "I have had time to broaden my awareness of what is possible and what is out there" (S.R., post-study questionnaire, p. 26). "Dialogue and collaboration have shown me many possibilities of exciting ways to use technology in creative ways. Classroom teachers are creative with what works with their students. I have learned that there are a lot of possibilities" (D.M., post-study questionnaire, p. 26). One participant discovered that she had several resources within the school to help with troubleshooting needs: "I learned that I am not alone! And that help is near" (E.H., post-study questionnaire, p. 26). Another participant described dialogue and collaboration as important factors for initiating her own pedagogical transformation: "I find dialogue and conversations with my colleagues to be the most useful in creating meaningful change. Particularly when the conversations are ongoing" (L.B., reflective journal, p. 2.2). Yet another participant echoes this point: "conversation with colleagues is always helpful for learning about professional practice. We are all a group of learners, so to share helps me learn. Dialogue is *hugely* important to me, and there is never enough time to do so!" (E.H., reflective journal, 1). These findings suggest that teacher-participants constructed knowledge from

others through the sharing of ideas and strategies, opening one another up to divergent thinking and new possibilities.

Dialogue and collaboration also helped participants feel less isolated, and offered reassurance that help was always near. As a collaborative inquiry group, participants constructed knowledge through collective problem solving at dialogue group sessions. At times, group members challenged one another and offered alternative ways of thinking about technology. Participants did not always agree with one another, but these differences always led to greater understanding. Through dialogic interaction, the participants in this study cultivated closer collegial relationships which enabled them to work, learn and solve problems together. This led to a deeper understanding by all members of the collaborative inquiry group. These findings on dialogue and collaboration clearly support Vygotsky's social constructivist theory which emphasizes the shared and social construction of knowledge.

Key Indicators of Changed Practice

Most participants felt that dialogue and collaboration had a strong impact that resulted in some changed professional practice. For example, one teacher regularly uses a classroom blog as a teaching tool which has resulted in experimenting with process documentation and reflection. Also, the blog sparked several student-led inquiries and encouraged students to be more transparent with their thinking.

Plans for changing practice. Four teacher participants described changes they would make to their practice in the following year. One teacher felt that her practice with technology would shift to more of a collaborative, project-based approach, and another teacher looked forward to making her teaching more interactive through the use of a SMART Board. "Next year, I will try some hands-on sites that I had no familiarity with prior to group meetings. Focus of technology as a class has shifted to more hands-on, collaborative group projects (with

support)” (B.E., post-study questionnaire, p. 26). Other teachers envisioned changes with technology in the next school year, feeling enthusiastic about experimenting and trying new approaches. One teacher felt that in order for her to integrate technology regularly, her practice and program would need to be transformed significantly. “I perceive a strong change is needed in my practice to use these technologies regularly. I could see my professional practice using online galleries...and websites. I look forward to using the SMART Board in my classroom” (D.M., post-study questionnaire, p. 26).

Advancing understanding. In a similar vein to knowledge construction, a common feeling among all teachers was the notion of “raising the bar” for one another. Sharing small triumphs in one’s practice with one another was motivating, inspiring, and kept group members “on their toes” knowing that they would be responsible for sharing examples of student work next time. “The experience is very motivating – it’s an opportunity to share something you’ve done (your family won’t notice, but if we share it with others, it can inspire growth and engender excitement)...[This process was an effective one for] pushing each other to a higher level” (B.E., interview, 2.1)

Reducing isolationism. The significance of collegial recognition was revealed at many points throughout the inquiry. Comments such as “that was a great idea!” or “I’m very interested in how you did this...” were affirming and motivating for teachers. Teaching can be a very isolated profession; often, the good work that teachers do goes unrecognized by others. As echoed by one participant, “Teachers are somewhat isolated in their classrooms, and finding time to collaborate with colleagues is too often put by the wayside” (L.B., reflective journal, 2.3). The collaborative inquiry provided a forum for sharing questions, concerns and outcomes, as well as a means for being acknowledged by colleagues. Through professional

dialogue and constructive feedback, the collaborative inquiry helped eliminate the isolation that teachers often face, creating an ethos of professionalism and positive reinforcement for the good work that was happening in classrooms. Such reinforcement and feedback from others is noted in the literature to help to raise individual and group morale, as well as to inspire continued successful practice (Johnson, 1993).

Fostering divergent thinking. Dialogue sessions were breeding grounds for inspiration, idea generation, and idea sharing. As ideas were cultivated and discussed, excitement about the potential of new technology escalated. In one instance, excitement was very obvious when two teacher-participants arrived to the session early. They immediately opened their laptops, began to share and discuss their ideas, and showed examples of how they had put new learning into practice. Their pride of accomplishment, interest in each other's work and support for one another was palpable (field notes, 16.1). Another example of synergy can be illustrated through the following observation. Upon introducing the collaborative inquiry group to a variety of Web 2.0 tools, teachers immediately began to chime in with possibilities and ideas for implementation. Exposure to alternative ways of thinking led participants to stretch their imagination, exploring ideas they may not have deemed possible prior to group sharing. Such synergy was evidenced throughout the collaborative inquiry project, and participants seemed to "feed off" one another, offering suggestion after suggestion about potential applications. Their excitement and enthusiasm was made very evident by teachers' gestures and facial expressions, as well as the volume of conversations.

The analysis of teachers' reflective journals provided great evidence of idea generation, in the form of mind maps, lists, charts and webs. Participants used the space in the reflective

journal to record possibilities they encountered in the collaborative inquiry group, as well as those ideas found online in their own professional learning networks.

Fostering divergent thinking through online professional learning communities.

Participants were also exposed to and invited to participate in online professional learning networks, for example, *Twitter* and *ArtEd 2.0*, which opened up a larger network for virtual idea sharing.

I have also been logging in to *Twitter* on a regular basis. Through *Twitter*, I have come across a number of arts-based websites and blogs to refer to. In addition, I have posted an interest in learning more about the Reggio approach, and have received a number of direct messages from other educators with web-based resources to refer to (L.B., reflective journal, p. 3).

Such virtual professional learning networks afforded participants the opportunity to connect, collaborate and share their learning with other like-minded educators, fostering divergent thinking beyond the confines of their school walls. These forums offered participants an electronic space for sharing ideas and receiving immediate feedback. The speed, facility and accessibility of such networks gave participants new ideas and constructive feedback within moments.

Social Constructivist Perspective

Vygotsky's social constructivist theory emphasizes the socio-cultural nature of learning – learning cannot be separated from one's context. He argued that knowledge is constructed through experience and interaction with one's culture and social context, and that language is a critical impetus for learning (Vygotsky, 1978). The findings and conclusions of this action research study support social constructivist theory, because, like the participants in Lawson's

(2008) cooperative inquiry study, the knowledge constructed by teacher-participants occurred in a social context. The findings also support Vygotsky's position that language is essential to knowledge construction, as participants used dialogue to make meaning related to their professional practice.

Shortcomings

The collaborative inquiry approach was not without its critics. While participants were generally enthusiastic and keen about the collaborative inquiry approach for their own professional learning, some drawbacks were also noted.

Diverse range of technology proficiencies. One participant described personal insecurities about technology as a limiting factor for growth. She stated, "Sometimes, people's insecurities about technology take over a bit" (S.R., post-study questionnaire, p. 24). Another drawback to this approach was the diverse range of technological knowledge and ability levels within the group, one participant "sometimes felt overwhelmed or lost" (E.H., post-study questionnaire, p. 24).

One participant felt that the approach only amplified what she did not know about technology when she commented, "Dialogue and collaboration hugely made me aware of how much I don't know...how much I need to spend time and effort informing myself." (D.M., interview, 6.7). The participant goes on to explain that "it's useful, because you can't grow if you don't know." Recognizing and acknowledging her stage in her own learning continuum would ultimately help her set goals in order to move forward. This self-awareness was a common thread woven throughout teachers' journeys through the collaborative inquiry study. Other perceptions, however, revealed a different perspective. Association with others in the group helped some participants feel that they were "not alone," that being with others in the

same position helped them realize that they were not isolated in their limited technological experience. It was satisfying to learn that others experienced challenges too. Participants also remarked that it was beneficial to observe others' aptitudes so that they would have an "in-house go-to" person to seek when they had difficulties to troubleshoot.

In considering the collaborative inquiry model for future professional development in the area of technology integration, it would be valuable to explore homogeneous proficiency groupings. In this scenario, participants would continue to engage in dialogic interaction, but within closer proximity of one another's knowledge, skills and abilities. In this way, participants could keep up with one another, choosing to work at the same comfortable pace while continuing to challenge each other, but avoiding distressing frustration.

Time. Time was also a hindering factor for the group. While participants argued that they appreciated having a sustained, long-term model for their professional learning, the five sessions were less than adequate to explore the many ideas, applications and strategies possible. An inquiry such as this one would have had a far greater impact if it had spanned over the entire academic year, meeting weekly or bi-weekly to explore new ideas, share successes and challenges, and provide support to one another. "[I have] no time to implement...[I'm] feeling unprepared since I have no classes with no new projects. I have high pressure to finish up existing projects" (D.M., reflective journal, 5). Not only was the *span* of the inquiry less than adequate, so too was the *timing* in the school year (mid-May to end-June), when teachers are winding down their school year, organizing field trips, and not terribly interested in professional development. This calendar timing drawback was echoed by several participants which made it challenging for participants to truly stay in the "groove" of professional self-improvement.

Collaboration time was also mentioned as a limitation – teachers at our school have no common or shared planning time. A collaborative inquiry model at our school would suggest that after-school or lunch hour periods were necessary for meetings, which teachers were not necessarily inclined to initiate at the point in time of this study.

The findings of this study suggest that a collaborative inquiry project spanning over the course of an entire academic year would allow for more powerful collaboration and dialogue amongst teachers, and more significant change over time. A model spanning over a longer term would also yield more in-depth, meaningful projects with students, reflective of the time it takes for true learning to transpire.

Personal Reflections

As the facilitator and action researcher of this project, it was extremely challenging to plan responsive professional development for teachers, and take field notes simultaneously. I wanted to be actively involved in the dialogue and collective problem-solving, but felt challenged to record my observations at the same time. In addition, as I was leading the mini-lessons based on group interest, there were many moments during the group's interactions and response to the new technologies that I wish I had been able to capture, but simply did not have the means. This could have been resolved through the use of a video-camera, to record group inquiry sessions.

Another learning experience for me was the timing of the project, and the expectations I placed on teacher-participants to submit a lesson plan, and revised action research cycles. This was simply not a realistic expectation for mid-May/June. In the midst of the project, I found myself asking "how could I have made this more manageable for June?" Just as learners are most fresh at the beginning of the day, teacher-learners are freshest at the outset of the school

year, when goal-setting for the upcoming year makes most sense. In the future, a consideration would be to plan a collaborative inquiry beginning in September or October, spanning the entire academic year, so that long-term, meaningful change can be effected in a more conducive and less stressful, time-constrained manner.

Conclusion

This chapter has presented the results gleaned from an analysis of the data collected throughout the collaborative inquiry project. Through careful reflection upon the data, and in an effort to honour and reflect participants' voices, I have attempted to resolve my initial research sub-questions.

The teacher-participants involved in this study arrived with varying experience and proficiencies with technology. The three generalist classroom teachers and two arts specialists involved in the project also came with distinct perspectives about arts education. All teachers had generally positive responses to the collaborative inquiry model as a form of professional development to help them integrate new technologies into their arts education programming. The collaborative inquiry impacted teachers' learning and thinking about the use of ICT in their arts education program in several ways. Teachers felt that the collaborative inquiry group afforded support, encouragement, a forum for dialogue and collaboration as well as a means to explore alternative perspectives and ideas they would otherwise not been exposed to. New habits of mind were beginning to emerge, including increased confidence and efficacy for risk-taking and exploration, increased capacity for evaluating ICT with pedagogical intent, as well as honed reflective practice and goal-setting strategies. In addition, change in practice was observed as tracked through changes in subject matter and materials, organizational structures, roles and behaviours, knowledge and understanding and value internalization.

Dialogue and collaboration proved to be influential in helping teacher-participants foster their construction of ICT knowledge. Dialogue and collaboration helped advance understanding as participants pushed each other to a higher level, raising the “pedagogical bar” for one another, helping to inspire continued successful practice. Divergent thinking was also fostered through dialogue and collaboration, as participants shared ideas and offered new ways of seeing. Alternative perspectives were shared and honoured, stretching learning in various directions. The social-emotional climate of the collaborative inquiry group – six participants from the same school context with similar values and educational philosophies – was conducive to actualizing this meaningful dialogue and collaboration.

Limitations of the innovation plan included its brief timeframe – five weeks – which contributed to the lack of meaningful, long-term projects being achieved. Also, timing in the school year was a limiting factor for authentic professional growth, as teachers were preoccupied with end-of-year commitments such as field trips, awards day and report cards. Another limitation involved the diverse range of ICT skills and abilities within the collaborative inquiry group. This heterogeneous grouping was not particularly conducive for individual learning, and added to participants’ frustration levels – especially when they were less adept with ICT.

For my professional growth, action research has proven to be a valuable tool as a means to improved practice. The cycle of identifying a need and setting a goal to develop my practice, drawing up a plan, following through with well thought-out action steps, carefully observing the impact of those actions and finally reflecting on the process has facilitated growth in my practice, in my role helping other teachers. I will now turn to presenting the

conclusions, recommendations and implications of this study in Chapter Five. Future directions for research will also be given.

Chapter Five: Conclusions and Recommendations

Chapter Overview

This final chapter presents a discussion of the key findings as they relate to the purpose and research questions guiding the study. Limitations of the innovation plan and implications for professional development and classroom practice are also presented. The chapter concludes with future directions for research.

Restatement of Purpose

The purpose of this action research study was to find a new way forward in my role as technology mentor. I aimed to provide quality professional development for teachers that responded to their unique needs, in order to help them integrate technology in meaningful, creative, and purposeful ways. Ultimately, I hoped to support teachers in their efforts to enhance student learning in, through and about the arts.

Restatement of Research Questions

The central research question explored in this study was: As an ICT mentor, how can I use the principles of action research to support teachers' professional learning in the integration of technology in an arts education program? The following sub-questions helped to guide the study further:

1. In what ways has the collaborative inquiry approach to professional learning had an impact on teachers' learning and thinking about the use of ICT in arts education?
2. In what ways has the collaborative inquiry approach to professional learning had an impact on participants' changed practice?
3. How do collaboration and dialogue foster the construction of knowledge related to teachers' integration of ICT to support their arts education program?

Summary of Key Findings

As a technology mentor seeking to improve her practice, action research presented me with a unique approach to: (a) providing effective professional development for teachers that was responsive to individual needs, and (b) supporting teachers' integration of technology in meaningful and creative ways. Through a cycle of planning, acting, observing and reflecting, I was able to not only implement a successful model for my own professional growth, but effectively shape teachers' learning and development as well.

The collaborative inquiry approach impacted teacher learning and thinking about the integration of ICT in arts education in a number of ways. In affording teacher-participants with blocks of time to collaboratively explore new digital tools with the support of a technology mentor (me), as well as providing constant access to technology resources, teachers developed confidence and capacity for risk-taking. Teachers developed a sense of efficacy as they applied new learning to their practice and received constructive feedback from their peers. Through a constructivist approach which included hands-on practice, experimentation and collaboration, participants learned new ways to integrate ICT meaningfully into their practice.

The individualized nature of the model, coupled with the extended timeframe allowed participants to establish and sustain their own learning agenda, giving them ownership and a sense of empowerment, as they chose the direction and pace for their own professional growth. The collaborative inquiry model provided an avenue for group sharing, problem solving and collegial support. Collaboration and dialogue fostered synergy for idea generation and generated excitement around technology infusion. Participants honed their reflective practice and sharpened their critical thinking skills as they learned to evaluate new technologies with pedagogical intent.

As a result of this action research study, participants revealed several changes aligned with pedagogical transformation which included: (a) changes in subject matter and materials such as the integration of new digital tools to support arts learning; (b) changes in organizational structures as evidenced by participants' desire to shift the traditional professional development model to a collaborative inquiry model; (c) changes in roles and behaviours such as assuming mentorship and expert roles; (d) increased knowledge and understanding, fostered through dialogue and collaboration; and finally (e) the internalization of transformed values, moving toward an openness and interest to exploring new technologies to support their arts education practice.

Collaboration and dialogue played a central role in helping teachers construct ICT knowledge in order to enhance and support their arts education program. The collaborative inquiry model enabled a professional learning community to emerge, which in turn, helped advance understanding as participants challenged one another to raise the "pedagogical bar." Alternative perspectives and new ways of seeing were shared by participants and helped to inspire divergent thinking.

Implications for Professional Development

Despite its limitations, this study has important implications for professional development and classroom practice. One of the most important findings to come out of this research is the need for a paradigm shift in the way arts and technology professional development is structured. Traditional workshops and in-services do not effect meaningful, long-term teacher change in learning to integrate ICT into practice. Instead, a model that puts teachers in the "driver's seat" of their own professional learning, that empowers teachers to make decisions about how and what to improve in their practice - a model that sees teachers as

researchers, inquiring into their teaching practice – offers the greatest prospect for pedagogical transformation.

Professional learning must involve a long-term, sustained sequence of professional learning experiences that moves teachers from comprehension through development, to implementation and evaluation of their own individualized action plans. This kind of professional learning is needed in order to help teachers find a way forward in their practice, in order to make meaningful change (Morin, 2009).

Professional development should also be linked to the school context, and if possible, take place within the school, built into the professional teaching day. In this way, teachers are less likely to feel that they are adding more to their “professional plate”, but rather, that their professional learning is seamlessly integrated into their practice – an especially important aspect of action research.

Professional development must also focus on individual participants’ unique needs and interests as learners. It must begin with what teachers already know, and build knowledge and capacity from that point. A constructivist approach is most valuable, especially when exploring technologies within an arts education context. Hands-on, interactive strategies with many opportunities for collaboration and dialogue amongst teachers are critical factors for effecting professional growth. A structure for providing teachers with support and immediate feedback – perhaps in the form of a peer coach or technology mentor – is also instrumental in the success of a professional learning model.

Finally, we must consider strategies for sustaining professional learning communities, where teachers have opportunities to meet regularly, to examine their work from multiple perspectives, to work collaboratively to generate solutions, to share successes and challenges

with one another, and to engage in reflective practice. Such strategies increase the chances of success for the adoption of an innovation, and ensure that teachers feel nourished professionally by a supportive community of learners (Morin, 2009).

The collaborative inquiry model presents a viable approach to teacher professional development, because it addresses all of these considerations. The collaborative inquiry model honours teachers as inquirers, decision-makers, and generators of knowledge. This approach holds significant promise as a professional learning model, especially in the area of technology integration.

Implications for Classroom Practice

In the arts, new digital tools present tremendous opportunities for pedagogical transformation, offering students and teachers new ways to express themselves creatively, virtual learning communities to support teachers in their practice, and new ways to make meaning, communicate, share and reflect on learning. As these new technologies emerge, teachers are faced with complex decisions about how to integrate these technologies in ways that support student learning, and enhance their teaching.

Technology must not be seen as a *substitute* for the real, hands-on learning that occurs in an arts education program, but it can offer many possibilities to support and extend the creative work that is already happening in arts-based classrooms. Technology can also make a distinctive contribution to the creative process, offering new tools, media and environments for learning to think and act creatively (Loveless, 2002a).

In order for teachers to regularly and meaningfully integrate ICT into their arts education practice, they must have access to up-to-date technology resources— both in the classroom, and at home – as well as access to a more capable support person, either a peer coach or technology

mentor, or even more capable student. Regular access will likely spur teachers' spontaneity and a willingness to "have a go," implementing new strategies with new digital tools.

Mark Prensky (2006), in his article titled, "Shaping Tech for the Classroom," identifies four stages of technology adoption: (a) dabbling with technology, (b) doing old things in old ways, (c) doing old things in new ways, and (d) doing new things in new ways. Jeff Utecht (2008) takes Prensky's technology adoption model one step farther, formulating important questions for teachers, which are useful in looking at implications for classroom practice: (a) Is the technology being used "just because it's there?" (b) is the technology allowing the teacher/students to do old things in old ways? (c) is the technology allowing the teacher/students to do old things in new ways? And finally, (d) is the technology creating new and different learning experiences for the students? Prensky reminds us that there are many different ways to use technology, and a wide spectrum for its creative application. Technology can be used as a reference tool, for the purposes of information retrieval all the way to its application as a creative or social tool. We need to push teachers beyond simply using the SMART Board as a contemporary version of the chalkboard, or using the internet to replace the encyclopedia.

Teachers must capitalize on new Web 2.0 tools to collaborate with one another, giving students new ways to share and reflect on their learning as young artists. Teachers with access to the latest digital tools can help their students become literate in new and dynamic ways, as they are given new means to express their ideas through non-traditional media - through text, images, video, audio – ways that are sure to hook our "digital natives" into learning.

While the potential exists for ICT to reshape and transform pedagogy, educators must critically evaluate new digital tools in order to assess advantages and disadvantages. In this

way, teachers will be better equipped to select and apply technologies that best support their learning intent, and meet their students' unique needs and learning contexts.

New ICT tools give rise to exciting possibilities for the advancement and promulgation of successful strategies for arts education. New digital technologies cross boundaries of space and time to enhance teaching and enrich learning in the arts. These tools expand opportunities for arts educators and their students who now have innovative ways to publish, share and to reflect about the role of arts in education with their peers from all over the world (Texas Commission on the Arts, 2001). Virtual learning communities offer new places and spaces for creating and sharing arts-making processes with other professionals, by providing opportunities to mentor and be mentored beyond the limitations of traditional classroom walls (Dunmill & Arslanagic, 2006).

Future Directions for Research

New digital tools offer exciting possibilities for the advocacy and development of promising practices for arts education. Research in this area has the potential to advance arts education program design, funding, teacher pedagogy and advocacy for the importance of arts in and across the curriculum. New growth means we need to generate and share new knowledge about the effective and creative use of technology in arts education.

Further research is needed to explore the creative potential of ICT, and its impact on arts pedagogies. An examination of new strategies and approaches that may be required is also warranted. Further inquiry into the effects of new technologies on learning and the merits of integrating technology in arts education programming with diverse student populations are needed.

In terms of professional development for teachers, a similar study to the present one, extended over a longer period of time – one academic year – would be an intriguing direction for future research. Teachers would participate in the same collaborative inquiry format as this study, but would be given more time between sessions to make sense of their learning in practice. Extended time and “space” would give teachers an opportunity to reflect more deeply about how their action steps are affecting student learning outcomes. It would also give them more time to test out new strategies in their practice, and collect data to inform future decisions. A longer-term collaborative inquiry would also strengthen and sustain a professional learning community amongst group members.

Another interesting focus for research would be streamlining the dynamic of the collaborative inquiry cohort to a more homogeneous grouping. Group members would self-evaluate on the continuum of technology adoption, situating themselves from an awareness stage all the way to creative application to new contexts stage. In this way, participants who are less technologically fluent would suffer less frustration, focussing more on basic applications to practice. Those participants who were ready to creatively apply technology to new contexts would be supported and challenged by their capable peers who would help nudge them to a higher level.

A Final Word

New technologies hold tremendous possibilities for arts educators. A professional development model that honours educators as inquirers, decision-makers and generators of knowledge, offers much promise for the promotion of best practices of ICT integration in arts education. In this study, it was found that action research presents a powerful way forward in

helping educators integrate new technologies in a meaningful, creative, and purposeful manner;
ultimately enriching student learning in, through and about the arts.

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Appendix A
Informed Consent Letter
(Teacher Participants)

Informed Consent Letter (Teacher Participants)

University of Manitoba Letterhead will be used.

April 14, 2009

Research Project Title: Exploring Promising Practices for New Technologies in Arts Education through Action Research

Student Researcher: Alana Chernecki, Master of Education Program, Studies in Curriculum, Teaching and Learning

This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

Purpose of the Research:

To investigate how a collaborative inquiry approach to professional learning supports teachers in their integration of technology into arts education programming.

Research Procedures: Early years classroom teachers and arts specialists in my school will be recruited to participate in a professional development program lasting 5 weeks. Teacher participants will meet four times for collaborative inquiry sessions, the first session lasting a full day, followed by two half-day sessions (1:00 – 3:30). Funding has been secured to provide teacher release time for these sessions. Teacher participants will also be asked to attend two after-school sessions, each lasting approximately 2 hours. Dates and times will be discussed and negotiated at our first session to suit participants' schedules.

In addition to collaborative inquiry sessions, I will provide support to teacher participants in the technology lab during scheduled technology times, as well as in their classrooms. While in the lab and classrooms, I will act as co-teacher and researcher-observer, recording observations in the form of field notes about the use of technology to support arts pedagogy.

Your Participation in Data Collection: You will be asked to participate in a variety of data collection procedures if you consent to participate in this study. These procedures will involve the following:

- Completing a pre-study and post-study needs-assessment questionnaire to determine your comfort level with technology (10-20 questions, requiring approximately 20 minutes each).
- Maintaining a reflective journal (or contributing your reflections on a secure blog site) during the research study in response to prompt questions. Time will be allotted during each collaborative inquiry session to reflect (15 minutes), but you will be encouraged to add your reflections throughout the course of the study (approximately 20 minutes per week).
- Planning and submitting two lesson plans, one at the outset of the study, and a second at the conclusion of the study (30 minutes each).
- Generating a mini action-plan to address a personally significant issue in your practice. These action plans will be revisited and revised each week as your understanding grows as a result of collaboration, dialogue and group knowledge construction. The initial action plan may take longer (30 minutes), but following revisions should only take 5-15 minutes.
- Participating in post-study group matrix interview which will be recorded in writing using a tool provided. This final portion of the study will occur after school, and will last approximately 1.5 hours.

Risk/Benefit Assessment: Potential benefits to participation in this study include the development of technology-rich resources to enhance teaching in the arts, increased teacher capacity through community-building and sharing of ideas, greater staff cohesion and collaborative support, as well as opportunities to learn from and with others. There is no risk associated to teacher participation in professional development programs.

Confidentiality and Anonymity: The identity of the teachers, school, and school division will be protected in any published reports or presentations. Participants' anonymity will be preserved by the use of pseudonyms. Direct quotations from group conversations, reflective journals, interviews and questionnaires may be used, but your identity will always be protected. All data will be confidential, secured and stored in a locked area of my home and classroom for which I will have sole access and viewing before, during and after the research activities. I will not use any real names in the field notes or data collection for teachers or school participating in this study. Pseudonyms for the teachers, school and school division will be used in the written report, and subsequent presentations. All data records kept on my computer will be password protected and accessed only by me. Upon completion of the study and oral defence of the thesis, all data will be deleted and/or shredded and discarded.

Participation and Compensation: Participation in this study is entirely voluntary, and you are free to request information at any time. You are also free to withdraw from the study at any time for any reason by informing me of your decision, and/or refraining from participating in any aspect of the data gathering, with no repercussions. Except for the release time to allow for participation in the daytime sessions, there will be no compensation for participation in this study.

If after receiving this letter you have any questions about this study, or would like further information to assist you in reaching a decision about participation, please feel free to contact my supervisor, Dr. Francine Morin at 474-9054 or fmorin@cc.umanitoba.ca, or contact me by e-mail or phone at the addresses below.

Your signature on this form indicates that you have understood your satisfaction of information regarding participation in the research project and agree to participate. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

Alana Chernecki

Phone: [REDACTED]

Email: achernecki@wsdl.org

This research has been approved by the Education and Nursing Research and Ethics Board, and by the Principal of your school. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Secretariat at 474-7122, or email Margaret_bowman@umanitoba.ca. A copy of this consent form has been given to you to keep for your records and reference.

Participant's Signature

Date

Researcher's Signature

Date

Feedback: The findings of the study will be made available to you upon completion of the research project. Please indicate your desire to receive the results of this study below.

- Yes, I wish to obtain a summary of the results of this study, once they become available.
Email address: _____

- No, I do not wish to obtain a summary of the results of this study.

Appendix B
Pre-Study Questionnaire

Pre-Study Questionnaire

1. Currently, I use technology in my classroom to support arts-based learning (learning *in, through, or about* the arts).

Please choose one answer only.

- everyday
- three times a week
- once a week
- once every two weeks
- once a month
- twice a year
- once a year
- never
- other: _____

2. I use technology with my students in the following stages of the inquiry process:

Please check all that apply.

- plan and question
- gather and make sense
- produce to show understanding
- communicate
- reflect

3. Please indicate how frequently you use the following technologies as part of your instruction. Place an "A" beside each technology if used to support arts-based activities.

- 1 = never
- 2 = several times a year
- 3 = several times a month
- 4 = several times per week
- 5 = daily

- _____ laptop in the classroom
- _____ computers in computer lab
- _____ iPod
- _____ digital microphone
- _____ electronic keyboard
- _____ CD player
- _____ digital camera
- _____ video camcorder
- _____ LCD projector
- _____ scanner
- _____ SMART Document camera
- _____ SMART Board
- _____ Other (please specify):

**4. How often do you use the following internet resources and digital tools?
Place an "A" beside each technology if used to support arts-based activities.**

- 1 = never
- 2 = several times a year
- 3 = several times a month
- 4 = several times per week
- 5 = daily

- _____ Blogs
- _____ Wikis
- _____ Webquests
- _____ Interactive websites
- _____ Virtual art galleries and museums
- _____ E-mail
- _____ Voice recording software
- _____ Google Docs
- _____ Google Earth
- _____ Paint/drawing programs
- _____ Image editing software
- _____ Digital storytelling programs
- _____ Movie-making / editing programs
- _____ Concept-mapping programs
- _____ Music composition/recording software
- _____ Dance composition/recording software
- _____ Other (please specify)

5. Which items do you consider to be significant obstacles to you using technology for instruction?

Please check all that apply.

- _____ limited availability of equipment
- _____ limited personal knowledge of technology
- _____ limited professional development
- _____ limited technology assistance for troubleshooting
- _____ limited knowledge about integrating technology in instruction
- _____ limited or outdated software
- _____ limited or outdated hardware
- _____ lack of time
- _____ Other (please specify):

6. How are you most likely to learn about new technologies for instruction?

Please check all that apply.

- _____ friends outside of school
- _____ students
- _____ school-based professional development
- _____ divisional professional development
- _____ teaching colleagues at your school
- _____ internet sites
- _____ newspaper / magazine / journal
- _____ educational technology consultant
- _____ television
- _____ technology mentor
- _____ Other (please specify):

7. Please read the descriptions of each of the six stages related to adoption of technology. Choose the stage that best describes where you are in the adoption of technology. Please check one stage.

	<p>Stage 1: Awareness I am aware that technology exists but have not used it - perhaps I'm even avoiding it. I am anxious about the prospect of using computers</p>
	<p>Stage 2: Learning the process I am currently trying to learn the basics. I am sometimes frustrated using computers. I lack confidence when using computers.</p>
	<p>Stage 3: Understanding and application of the process I am beginning to understand the process of using technology and can think of specific tasks in which it might be useful.</p>
	<p>Stage 4: Familiarity and confidence I am gaining a sense of confidence in using the computer for specific tasks. I am starting to feel comfortable using the computer.</p>
	<p>Stage 5: Adaptation to other contexts I think about the computer as a tool to help me and am no longer concerned about it as technology. I can use it in many applications and as an instructional tool.</p>
	<p>Stage 6: Creative application to new contexts I can apply what I know about technology in the classroom. I am able to technology as an instructional tool and integrate it into the curriculum.</p>

8. Technology Integration Interests

On a scale of 0 to 5, rank these topics or skills in terms of how much you want to learn about them through the course of the collaborative inquiry project.

- 0 = no interest
- 1 = little interest
- 2 = interest
- 3 = moderate interest
- 4 = very interested
- 5 = my top priority

Pedagogical Focus	Example of Digital Tool	Interest (0-5)
Gather and make sense	Digital cameras, video, microphones and scanners, YouTube videos, Virtual art galleries, concept mapping software, Webquests (virtual scavenger hunt)	
Collaboration with others around the world	Skype, Wikis, e-mail, social networks, blogs	
Student reflection	VoiceThread, blogs	
Sharing and Celebration	Blogs, iMovie,	
Teacher networking and sharing ideas with others around the globe	Social networks, Twitter, EdTechTalk	
Communicating understanding	PhotoStory (digital storytelling), Movie-making, Garageband	
Creative expression	Paint.net Garageband PhotoStory iMovie Scanners, cameras, video	

9. Please describe three ways you have used technology to enhance your own teaching and/or support student learning in, through or about the arts.

1.

2.

3.

10. What do you view as the greatest challenge or obstacle to your effective integration of technology in student lessons this year?

11. Anything else you would like to share about your use of technology in the classroom or what you would like to learn?

12. In your experience, please describe the types of professional development that had the greatest impact on your practice.

12. How important are dialogue and collaboration in your professional learning?

Not Important

1

2

3

Very Important

4

Sources:

- <http://dsscoe.googlepages.com/teachersurvey.pdf>
- Christensen, R. (1997). Effect of technology integration education on the attitudes of teachers and their students. Doctoral dissertation, Univ. of North Texas.
Based on Russell, A. L. (1995) Stages in learning new technology. Computers in Education, 25(4), 173-178. Available at:
<http://www.tcet.unt.edu/research/online/stages.htm>

Appendix C
Post-Study Questionnaire

Post-Study Questionnaire

1. Currently, I use technology in my classroom to support arts-based learning (learning *in, through, or about* the arts).

Please choose one answer only.

- everyday
- three times a week
- once a week
- once every two weeks
- once a month
- twice a year
- once a year
- never
- other: _____

2. I use technology with my students in the following stages of the inquiry process:

Please check all that apply.

- plan and question
- gather and make sense
- produce to show understanding
- communicate
- reflect

3. Please indicate how frequently you use the following technologies as part of your instruction. Place an "A" beside each technology if used to support arts-based activities.

- 1 = never
- 2 = several times a year
- 3 = several times a month
- 4 = several times per week
- 5 = daily

- _____ laptop in the classroom
- _____ computers in computer lab
- _____ iPod
- _____ digital microphone
- _____ electronic keyboard
- _____ CD player
- _____ digital camera
- _____ video camcorder
- _____ LCD projector
- _____ scanner
- _____ SMART Document camera

_____ SMART Board
_____ Other (please specify):

4. How often do you use the following internet resources and digital tools? Place an "A" beside each technology if used to support arts-based activities.

1 = never
2 = several times a year
3 = several times a month
4 = several times per week
5 = daily

_____ Blogs
_____ Wikis
_____ Webquests
_____ Interactive websites
_____ Virtual art galleries and museums
_____ E-mail
_____ Voice recording software
_____ Google Docs
_____ Google Earth
_____ Paint/drawing programs
_____ Image editing software
_____ Digital storytelling programs
_____ Movie-making / editing programs
_____ Concept-mapping programs
_____ Music composition/recording software
_____ Dance composition/recording software
_____ Other (please specify)

**5. Which items do you consider to be significant obstacles to you using technology for instruction?
Please check all that apply.**

_____ limited availability of equipment
_____ limited personal knowledge of technology
_____ limited professional development
_____ limited technology assistance for troubleshooting
_____ limited knowledge about integrating technology in instruction
_____ limited or outdated software
_____ limited or outdated hardware
_____ lack of time
_____ Other (please specify):

7. Please read the descriptions of each of the six stages related to adoption of technology. Choose the stage that best describes where you are in the adoption of technology. Please check one stage.

	<p>Stage 1: Awareness I am aware that technology exists but have not used it - perhaps I'm even avoiding it. I am anxious about the prospect of using computers</p>
	<p>Stage 2: Learning the process I am currently trying to learn the basics. I am sometimes frustrated using computers. I lack confidence when using computers.</p>
	<p>Stage 3: Understanding and application of the process I am beginning to understand the process of using technology and can think of specific tasks in which it might be useful.</p>
	<p>Stage 4: Familiarity and confidence I am gaining a sense of confidence in using the computer for specific tasks. I am starting to feel comfortable using the computer.</p>
	<p>Stage 5: Adaptation to other contexts I think about the computer as a tool to help me and am no longer concerned about it as technology. I can use it in many applications and as an instructional tool.</p>
	<p>Stage 6: Creative application to new contexts I can apply what I know about technology in the classroom. I am able to technology as an instructional tool and integrate it into the curriculum.</p>

8. Technology Integration Interests

As a result of the collaborative inquiry study, please indicate your **current** interest in learning about the following digital tools to support arts-based activities. Please rank these topics on a scale from 0-5.

0 = no interest

1 = little interest

2 = interest

3 = moderate interest

4 = very interested

5 = my top priority

Pedagogical Focus	Example of Digital Tool	Interest (0-5)
Gather and make sense	Digital cameras, video, microphones and scanners, YouTube videos, Virtual art galleries, concept mapping software, Webquests (virtual scavenger hunt)	
Collaboration with others around the world	Skype, Wikis, e-mail, social networks, blogs	
Student reflection	VoiceThread, blogs	
Sharing and Celebration	Blogs, iMovie,	
Teacher networking and sharing ideas with others around the globe	Social networks, Twitter, EdTechTalk	
Communicating understanding	PhotoStory (digital storytelling), Movie-making, Garageband	
Creative expression	Paint.net Garageband PhotoStory iMovie Scanners, cameras, video	

9. After participating in the cooperative inquiry project, please describe three new ways you have used technology to enhance your own teaching and/or support student learning in, through or about the arts.

1.

2.

3.

10. What has been the greatest challenge or obstacle to your effective integration of technology throughout this project?

20. Please describe the ways in which dialogue and collaboration have fostered knowledge related to your professional practice? What have you learned?

21. To what degree do you perceive that the dialogue and collaboration had impact that resulted in changes to your professional practice?

No Impact

Strong impact

1

2

3

4

22. If you did perceive changes in your professional practice, describe these changes, citing examples and evidence if possible. How has your professional practice changed as a result of your participation in this collaborative inquiry group?

23. Other comments. Please provide any other information that you deem important to this research study.

Thank you kindly for your participation in this study. Your feedback is very important to me!

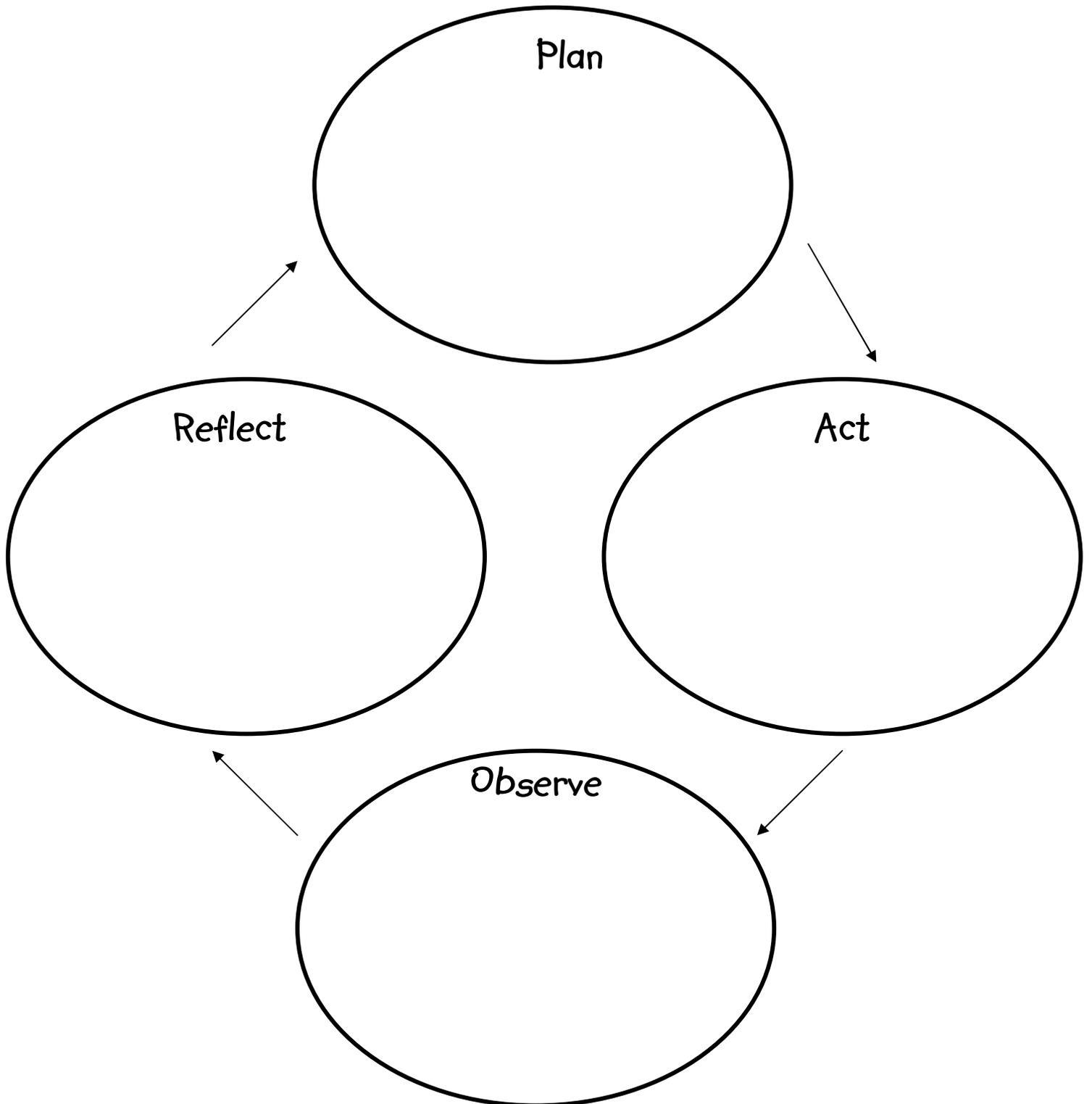
Alana

Sources:

- <http://dsscoe.googlepages.com/teachersurvey.pdf>
- Christensen, R. (1997). Effect of technology integration education on the attitudes of teachers and their students. Doctoral dissertation, Univ. of North Texas.
Based on Russell, A. L. (1995) Stages in learning new technology. Computers in Education, 25(4), 173-178. Available at: <http://www.tcet.unt.edu/research/online/stages.htm>
- Lawson, J. (2008). An examination of cooperative inquiry as a professional learning strategy for inner-city principals. Doctoral dissertation, University of Manitoba.

Appendix D
Teacher's Action Plan

Teacher's Action Plan



Appendix E
Lesson Plan Rubric

Arts + Technology Integrated Lesson Plan Rubric

0 = no evidence, 1 = weak evidence, 2 = some evidence,
3 = strong evidence, 4 = very strong evidence

1. Lesson Objectives:

Tasks (what will students do?), Intent (what will students learn?) and Criteria (how will students know they have achieved success?) for the lesson are well developed, and criteria for success are co-constructed by students and teacher.

(i.e. is the purpose for the lesson clear, and do the tasks enable the lesson purpose to be achieved?)

0 1 2 3 4

2. Arts Focus:

The lesson incorporates outcomes from the *Draft Manitoba Curriculum Frameworks of Outcomes for Arts Education: K to 8*, in either an integrated or discrete manner.

- Arts language and performance skills
- Creative expression
- Arts in context
- Valuing arts experience

0 1 2 3 4

3. Technology Justification

Technology supports student learning in a meaningful way, engaging students through active participation and/or collaboration.

0 1 2 3 4

4. Creative Pedagogy with Technology

There is evidence of new technologies being used to creatively enhance teaching methods and/or evidence that familiar technologies are being used in innovative ways.

0 1 2 3 4

5. Collaboration

The teacher has collaborated with colleagues (arts specialists/technology mentors) to seek out ideas, resources and/or feedback for lesson planning.

0 1 2 3 4

Notes:

Appendix F
Interview Matrix Technique
Interview Questions

The Interview Matrix

Description of Activity

Create four or five key questions that you will use to help teachers review a topic or explore a topic that is new to them. The questions should be somewhat open ended so that they cannot be answered with “yes/no” or short one word/one sentence answers.

Have teachers work in groups the size of the number of questions that you have. For example, for 5 questions, have teachers work in groups of 5.

Have teachers in each group “number off” so each teacher has a number from 1 to 5. Each of the numbers (1 through 5) is assigned a question that pertains to the topic to be reviewed or explored.

Each teacher is given time to interview the other teachers in their group to collect information related to the question that they have been given. Depending on the situation, two minutes per question is sufficient.

Then, all the same numbers meet together (all the number 1’s, number 2’s etc.) and share the information they have collected. Their task is to complete a composite list of information that has been collected from all the groups and to share this information with the whole group. Flip chart paper and markers or electronic visuals are helpful here.

Each number group reports on the information they have collected. You can lead the activity so there is an opportunity for you and the teachers to comment, extend, refine or offer alternative ideas.

Source: Dianne Bloor, Learning and Teaching Services, Algonquin College
<http://www.algonquincollege.com/lts/retreat/documents/Interviewmatrix.doc>

Interview Questions

Using Interview Matrix Technique

1. What are your general perceptions in terms of the value of the collaborative inquiry sessions in which we have participated?
2. What topics of discussion and/or mini-lessons were most valuable to you? Why?
3. How have dialogue and collaboration played a role in developing your awareness of your own learning?
4. Is collaborative inquiry an effective strategy for your professional learning? Why or why not?

Appendix G
*Additional handouts to teachers:
Collaborative Inquiry Project Outline*

Project Outline for Teachers

1. Reminder for each group member to write/email an observation (something that you want to address involving technology in your arts-driven programme) and a preliminary question before: (date)_____. Use the Collaborative Inquiry Criteria (attached) to help you carve out a successful action research project. We will begin our first session by listing our questions, and devising possible solutions.
2. Over the next five weeks, you will be asked to implement a strategy or a mini project that will help to address your question. You may wish to use the **Teacher's Action Plan** template to guide you through this process. We will discuss potential solutions as a group, and help each other through the process. I will be available to support you in your classroom and in the lab, as well collaborate and plan with you before school, during the lunch hour or after school.
3. In your reflection journal, jot down notes on what you are observing (both direct observations and reflective observations). Also, come prepared to share ways that I can support you through co-teaching in your classroom, or in the lab. Also to note, are resources or software that you wish to explore or use in your teaching.
4. Each week, we will meet to discuss your findings. What is working, and what isn't. I will also share strategies for technology infusion, sharing possibilities for the integration of new digital tools.
5. On the fourth week, we will meet to share final successes and celebrate our projects. We will also discuss next steps for action, perhaps at a school-based level.
6. Finally, we will meet to interview one another using an *Interview Matrix Technique* to uncover your perceptions about the Collaborative Inquiry model for your own professional learning.

If you would like some help generating a question, with strategies or implementation - please let me know! I am available to help.

Appendix H
*Additional handouts to teachers:
Collaborative Inquiry Criteria*

Collaborative Inquiry Criteria

A successful collaborative inquiry project:

- 1. is based on a powerful inquiry question that guides teachers toward a deeper understanding of one or more of the key elements of the program of studies**
 - focus on concepts and/or processes in the new program of studies (technology + arts education)
- 2. is designed to impact student learning**
 - integrates exemplary instructional strategies
 - includes effective assessment processes
- 3. engages teachers in the inquiry process**
 - includes a plan for focused teacher professional development
 - includes a plan for sharing project learnings and results with colleagues
- 4. outlines an effective project management plan**
 - identifies indicators of success
 - supports school-based initiatives
 - has the support of school administrator

Adapted from:

<http://www.teachers.ab.ca/SiteCollectionDocuments/ATA/Quick%20Links/Publications/Other%20Publications/ActionResearch.pdf>

Appendix I
Additional attachments:
Letter to Principal

April, 2009

Dear [REDACTED],

As you are aware, I am a graduate student working on my Master of Education in Curriculum, Teaching and Learning at the University of Manitoba. I am hoping to conduct my thesis research with my colleagues at [REDACTED] School. In order to do this, the University of Manitoba requires I receive permission from you and Ms. Pauline Clarke (the Chief Superintendent for the Winnipeg School Division) for my research to take place in our school and school division.

The title of my thesis is *Exploring Promising Potential of New Technologies in Arts Education*. The planned period of research is five weeks (mid-May to end-June). This action research study explores how a collaborative inquiry approach to professional learning supports teachers in their integration of technology into arts education programming. A comprehensive review of the literature, including the theoretical underpinnings and related topics will be included.

As technology mentor for my early years colleagues, my role is to support teachers' infusion of technology into all aspects of the curriculum, collaborating with teachers and planning technology-rich experiences and projects for students, modeling lessons, and offering 1:1 or small group professional development. As an arts-based school, our programming supports the placement of the arts at the center of curriculum, and as a result, much of our work with technology supports, extends and enhances students' learning in, through and about the arts. New technologies offer unprecedented potential for innovative teaching and learning, but research suggests that teachers feel ill-prepared to integrate technology to support student learning in an innovative manner, and consistently report an increased need for professional development to effectively employ technology in their practice (Dawes, 2001; Hughes & Ooms, 2004).

In the last year, my role as technology mentor has changed, and the time I have to collaborate and plan with teachers has been minimized. This limited collaborative time presents many challenges for me and the teachers I work with. I feel disconnected from classroom learning, and unable to model technology infusion in a creative way that connects meaningfully to students' own arts learning. Second, I find that as busy teachers, we do not have the time to research, explore and "play" with new digital tools to develop facility with them, and as a result, we often go back to the "tried and true recipes" rather than taking creative risks to explore the potential of new technologies (British Educational Communications and Technology Agency, 2004; Fabry & Higgs, 1997; Schifter, 2008). The challenges I face in my role as technology mentor have inspired me to find a new way forward; to provide quality professional development for the teachers I work with, responsive to their unique needs, where teachers will have the opportunity to explore, collaborate, share ideas, and solve personally and collectively significant issues in a supportive, social context, ultimately promoting promising practices for new technologies in arts education.

Action research was determined to be the best methodology for this study because it encourages teachers to investigate their own practice, to "find ways of living more fully in the direction of their educational values" (McNiff, p. 8). Through a cyclical process of planning, acting, observing and reflecting (Kemmis and McTaggart, 1988), teachers create new ideas about how to improve their practice, and put those ideas forward as their personal theories of

practice. Action research is also a powerful form of professional development. Current constructivist notions on the professional development of teachers maintain that teachers should be actively pursuing their own questions and dilemmas, reflecting critically on their practice to construct new knowledge and theories about content, pedagogy, and learners.

Early years classroom teachers and arts specialists in my school will be recruited to participate in a professional development program lasting 5 weeks. Teacher participants will meet four times for collaborative inquiry sessions, the first session lasting a full day, followed by two half-day sessions (1:00 – 3:30). Funding has been secured to provide teacher release time for these sessions. Teacher participants will also be asked to attend two after-school sessions, each lasting approximately 2 hours. Dates and times will be discussed and negotiated at our first session to suit participants' schedules.

In addition to collaborative inquiry sessions, I will provide support to teacher participants in the technology lab during scheduled technology times, as well as in their classrooms. While in the lab and classrooms, I will act as co-teacher and researcher-observer, recording observations in the form of field notes about the use of technology to support arts pedagogy.

Each collaborative inquiry session will include the following elements:

- Dialogue about issues of concern, followed by brainstorming of possible solutions, and sharing of teacher learning
- Mini-lesson – I (or other participant) will model the use of new technologies based on participants' needs and interest
- Action planning – time for participants to think, act, observe, and reflect on their own and others' practice, supporting one another through dialogue and collaboration.
- Reflection time (respond to prompting questions in reflective journals)

Teacher-participants will be asked to participate in the following data collection procedures:

- **Pre-** (Appendix B) and **post- study questionnaires** (Appendix C) to determine issues of concern and needs for teachers, and to guide my planning for collaborative inquiry mini-lessons. Additionally, at the conclusion of the study, the questionnaires will be compared to determine growth and changes in teachers' perceptions about their pedagogy with ICT.
- **Ongoing action plans** (Appendix D): teachers will craft research questions of individual interest, and explore possible ways to address them, revising their plans throughout the course of the study. These action plans will provide me with insight about how participants' thinking has changed as a result of dialogue, collaboration and critical reflection.
- Two **teacher-created lesson plans** (one at the outset of the study, and one at the conclusion of the study) will be compared to explore evidence of teacher change and assessed using a researcher-designed rubric (Appendix E).
- **Reflective journals**: teachers will respond to prompting questions in order to explore teachers' pedagogical thinking about the use of technology in their programming.
- While in the lab and classrooms, I will act as co-teacher and researcher-observer, recording observations in the form of **field notes** about the use of technology to support arts pedagogy.
- **Interviews** (Appendix F): teachers will participate in an interview matrix technique (Appendix F) in order to ascertain the effectiveness of collaborative inquiry as an

approach to professional development.

Written consent will be obtained from all teachers participating in this action research project in the form of a detailed consent form (please see attached).

If you have any question or comments relating to this action research study please feel free to contact me at home ([REDACTED]), school ([REDACTED]) or via e-mail: achernecki@wsd1.org. Your signature below indicates that you provide permission for the described research to take place at [REDACTED] School. Please return one copy of the signed consent form in the attached envelope directly to me at [REDACTED] School and keep the other for your records. Thank you for your time and consideration.

Sincerely,

Alana Chernecki

Appendix J
*Additional attachments:
Letter to Superintendent*

April, 2009

Dear Ms. Clarke,

I am a teacher in the Winnipeg School Division at [REDACTED] School who is currently working toward a Master of Education in Curriculum, Teaching and Learning at the University of Manitoba. I am hoping to conduct my thesis research with my colleagues at [REDACTED] School. In order to do this, the University of Manitoba requires I receive permission from you and [REDACTED] (the principal of [REDACTED] School) for my research to take place in our division.

The title of my thesis is *Exploring Promising Potential of New Technologies in Arts Education*. The planned period of research is five weeks (mid-May to end-June). This action research study explores how a collaborative inquiry approach to professional learning supports teachers in their integration of technology into arts education programming. A comprehensive review of the literature, including the theoretical underpinnings and related topics will be included.

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In the last year, my role as technology mentor has changed, and the time I have to collaborate and plan with teachers has been minimized. This limited collaborative time presents many challenges for me and the teachers I work with. I feel disconnected from classroom learning, and unable to model technology infusion in a creative way that connects meaningfully to students' own arts learning. Second, I find that as busy teachers, we do not have the time to research, explore and "play" with new digital tools to develop facility with them, and as a result, we often go back to the "tried and true recipes" rather than taking creative risks to explore the potential of new technologies (British Educational Communications and Technology Agency, 2004; Fabry & Higgs, 1997; Schifter, 2008). The challenges I face in my role as technology mentor have inspired me to find a new way forward; to provide quality professional development for the teachers I work with, responsive to their unique needs, where teachers will have the opportunity to explore, collaborate, share ideas, and solve personally and collectively significant issues in a supportive, social context, ultimately promoting promising practices for new technologies in arts education.

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constructivist notions on the professional development of teachers maintain that teachers should be actively pursuing their own questions and dilemmas, reflecting critically on their practice to construct new knowledge and theories about content, pedagogy, and learners.

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Each collaborative inquiry session will include the following elements:

- Dialogue about issues of concern, followed by brainstorming of possible solutions, and sharing of teacher learning
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- Action planning – time for participants to think, act, observe, and reflect on their own and others' practice, supporting one another through dialogue and collaboration.
- Reflection time (respond to prompting questions in reflective journals)

Teacher-participants will be asked to participate in the following data collection procedures:

- **Pre-** (Appendix B) and **post- study questionnaires** (Appendix C) to determine issues of concern and needs for teachers, and to guide my planning for collaborative inquiry mini-lessons. Additionally, at the conclusion of the study, the questionnaires will be compared to determine growth and changes in teachers' perceptions about their pedagogy with ICT.
- **Ongoing action plans** (Appendix D): teachers will craft research questions of individual interest, and explore possible ways to address them, revising their plans throughout the course of the study. These action plans will provide me with insight about how participants' thinking has changed as a result of dialogue, collaboration and critical reflection.
- Two **teacher-created lesson plans** (one at the outset of the study, and one at the conclusion of the study) will be compared to explore evidence of teacher change and assessed using a researcher-designed rubric (Appendix E).
- **Reflective journals**: teachers will respond to prompting questions in order to explore teachers' pedagogical thinking about the use of technology in their programming.
- While in the lab and classrooms, I will act as co-teacher and researcher-observer, recording observations in the form of **field notes** about the use of technology to support arts pedagogy.
- **Interviews** (Appendix F): teachers will participate in an interview matrix technique (Appendix F) in order to ascertain the effectiveness of collaborative inquiry as an approach to professional development.

Written consent will be obtained from all teachers participating in this action research project in the form of a detailed consent form (please see attached).

If you have any question or comments relating to this action research study please feel free to contact me at home (████████), school (████████) or via e-mail: achernecki@wsd1.org. Your signature below indicates that you provide permission for the described research to take place in the Winnipeg School Division. Please return one copy of the signed consent form in the attached envelope directly to me at ██████████ School and keep the other for your records. Thank you for your time and consideration.

Sincerely,

Alana Chernecki

Enclosures: 1